

# Blueprint Index

# Residential Standards

P400-00-005

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# Residential Blueprints

## Blueprint # 1

**Q:** Do relocated residential buildings have to comply with the standards when no conditioned space is added?

**A:** No, the standards do not apply to relocated buildings. The standards do not consider a relocated existing building a new building and compliance is not required. The standards would apply only to “new” building construction and to buildings where new conditioned floor area is added to the existing building. You may be required to comply with local energy conservation ordinances. You should contact the local enforcement agency to verify if these ordinances will affect the relocated project. The Energy Commission recommends that all energy conservation measures that are cost-effective and feasible be installed during the reconstruction of your building.

**Q:** What are the new residential building standards compliance requirements for an unconditioned solarium/greenhouse?

**A:** None, provided that the solarium/greenhouse will remain unconditioned; for example, a “thermal break” is maintained between the conditioned living spaces and the unconditioned solarium/greenhouse. A “thermal break” may be accomplished by a door or a sliding glass door to maintain the thermal integrity of the building envelope. Also, there should be no ducts joining the two spaces together which would allow for the conditioning of the solarium/greenhouse unless dampers are installed that would allow for the conditioning of the solarium/greenhouse. Additionally, you should consult with the local enforcement agency to confirm any local codes or ordinances that may affect the installation of a solarium/greenhouse.

**Q:** For residential buildings how are the correct glazing areas determined?

**A:** Use the “rough opening” to determine the glazing area for all compliance methods.

## Blueprint # 2

**Q:** If a duplex is being modeled on a unit by unit basis, should the building comply with the single-family budgets or the multi-family budgets?

**A:** If the units of the duplex share a common wall, they must comply with the multi-family budgets. If the units are “zero lot line” buildings that do not share a common wall, they must comply with the single-family budgets.

## Blueprint # 18

**Q:** Should kneewalls be insulated as walls or attics when located adjacent to an attic space?

**A:** Kneewalls are walls and should be insulated as walls as specified by the chosen method of compliance.

## Blueprint # 19

**Q:** The Energy Conservation Manual says that worksheets must be submitted whenever a water heater other than a 50 gallon or less gas non-recirculating water heater is installed, but the computer programs don't produce the worksheets. Do I need to fill out and submit a worksheet?

**A:** No. The worksheet calculations are internal to the approved computer programs. The system characteristics will appear on the CF-1R and C-2R automatically and, therefore, no separate worksheet is required.

## Blueprint # 20

**Q:** What can I do if the only rating available on my certified equipment is an EER (for example, air conditioners over 65,000 Btu), but the compliance approaches all require as SEER?

**A:** In this case use the EER in lieu of the SEER. This is only acceptable for equipment not required to be tested for an SEER rating. Use the appropriate duct efficiency factor.

**Q:** Is there any way to determine an HSPF for certified equipment that only has a COP (for example, through-the-wall heat pumps)?

**A:** At this time you should assume that through-the-wall heat pumps meet the minimum HSPF (6.6). Duct efficiency credits may not be taken, so you should assume the default (ducts in attic). However, for central air conditioning heat pumps, calculate the HSPF as:  $HSPF = (3.2 \times COP) - 2.4$ . Use the appropriate duct efficiency factor.

## Blueprint # 23

**Q:** I am using the performance compliance approach for a 7-unit apartment complex. Each unit has its own water heater and there is an unconditioned laundry room with its own water heater. Should I model 7 or 8 water heaters?

**A:** Model 7 water heaters. The building standards do not regulate a water heater

serving an unconditioned space.

**Q:** I'm using a computer program to model a slab on grade house. Do I use the nominal mass thickness or the actual thickness?

**A:** Model the actual thickness. For example, for a nominal 4 inch slab, enter 3.5 inches.

### **Blueprint # 24**

**Q:** Do the standards require insulation on rim joists located between the stories of a multi-story building? If so, should they be insulated as floors or walls?

**A:** Rim joists are part of the wall and should be insulated to the same level as the wall.

### **Blueprint # 25**

**Q:** Package D in Climate Zones 1 and 16 requires R-7 slab edge insulation. I understand that I can treat garages and entry areas (such as steps or a porch) as if they had R-7 insulation. If I add concrete around the house (for example, a walkway) would this also eliminate the need for R-7 insulation?

**A:** No. Garages and entry areas are the only areas that are treated as having R-7 slab edge insulation.

### **Blueprint # 26**

**Q:** What must be included as indirectly conditioned space when calculating the conditioned floor area?

**A:** Any area that meets the definition of indirectly conditioned space (see Energy Conservation Manual) must be included. Examples of areas that may be indirectly conditioned space include enclosed porches, enclosed sunrooms, laundry rooms, and furnace rooms.

### **Blueprint # 27**

**Q:** One of the mandatory requirements of the standards is equipment sizing. Why doesn't the Energy Commission provide the means to comply with this requirement? Where can I get help?

**A:** The Commission does not provide more information on equipment sizing because the Business and Professions Code restricts who may perform this function. While the energy standards limit the oversizing of heating equipment, a well designed HVAC system will also be based on the orientation and features of the

house, duct design, and placement for registers. The system design, and equipment sizing and selection should be done by a professional engineer or otherwise qualified individual using an approved sizing method.

**Q:** I'm building a two-story house, the bottom floor of which is slab. Do I consider this slab or raised floor construction?

**A:** Most likely it is slab. However the conditioned footprint determines the type of construction. If more than 50% of the conditioned footprint is slab, consider it slab floor construction. If it is 50% or more raised floor, consider it raised floor construction. In other words, unless the house you're building has twice as much conditioned space on the second floor as it does on the first floor, consider it slab floor construction.

## **Blueprint # 28**

**Q:** Does putting a mobile home on a permanent foundation make it subject to the residential energy standards?

**A:** No. According to the Department of Housing and Community Development (which enforces state and federal standards applicable to manufactured, or mobile homes) putting a mobile home on a permanent foundation does not change its status as a manufactured home.

**Q:** What is the difference between a manufactured (or mobile) home and a factory-built home?

**A:** A factory-built home is one that is delivered in pre-assembled parts, either walls or rooms. Factory-built homes must comply with the energy standards. A manufactured home is built in one or more sections and requires a highway use permit to transport it. Manufactured homes are built to a federally preemptive standard which is enforced by HUD-approved inspection entities. Manufactured homes have a federal certification label ("HUD label") on them indicating that they may have met the applicable federal standards. Manufactured homes are not subject to the state energy efficiency standards. Questions regarding standards

## **Blueprint # 28 continued...**

applicable to manufactured homes can be directed to the Manufactured Housing Section of the Department of Housing and Community Development (916) 445-3338.

**Q:** I install greenhouses with a curved glass panel at the intersection of the wall and roof planes. Is there a simple way to figure out how much of the glass is vertical glazing and how much is skylight?

**A:** The portion of glazing that has a tilt of less than 60 degrees from the horizontal is considered to be in the roof and therefore a skylight. One of the simplest ways to determine how much is vertical glass and how much is skylight is to simply extend the lines of the wall and roof planes until they intersect and measure them to that point.

**Q:** Should moveable exterior shading devices (i.e. shade screens) be considered in place year round, or are they given the same operating schedule as interior shades?

**A:** In all the performance methods exterior shading devices are assumed to be in place year round.

## **Blueprint # 29**

**Q:** I'm adding a bedroom on one side of my house, and putting a sliding glass door in the family room. I'm using the "addition alone" compliance procedure. Does the area of this glass door figure into my compliance calculations?

**A:** No. The sliding glass door is considered to be an alteration that "does not create conditioned space," and is subject only to mandatory requirements. Only alterations to water heating and heating, ventilation and air conditioning (HVAC) systems that are in conjunction with the addition must be included in compliance calculations.

## **Blueprint # 30**

**Q:** According to the Uniform Mechanical Code (UMC), Section 803, when a gas log is installed in a fireplace, the damper must be permanently blocked open. Yet, the Building Energy Efficiency Standards require fireplaces to have an "operable" damper. How can I install a gas log in the fireplace of my new home?

**A:** You cannot install a gas log in the fireplace in your new home. The energy standards require that fireplaces have an operable damper so that the occupant can

### **Blueprint # 30 continued...**

stop the flow of conditioned air out the chimney when the fireplace is not in use. The UMC requirement that the damper be permanently blocked open if a gas log is installed directly conflicts with the intent of the energy standards and would result in significant loss of conditioned air. Note that the UMC requirement for a permanently open damper applies to gas logs but not to gas-fueled log lighters. However, any gas installation in a fireplace poses a potential safety hazard when the damper is closed. We recommend caution in the use of log lighters. In addition, if building officials encounter gas log installations in retrofit situations, they should be certain the installation meets the UMC requirements.



## Blueprint # 32

**Q:** In the HVAC systems I've designed for a tract of homes, the furnaces meet all the criteria for zonal control credit, and a cooling system is optional. Can I take zonal control credit for both heating and cooling systems, even though the cooling system may not be installed?

**A:** You can take credit for both heating and cooling systems as long as you meet all the zonal control criteria and the system (i.e. designed to be interconnected with the central furnace and with ducts sized for the air flow required for cooling). Additionally, the following should be noted at the time of inspections:

- Common ducts are sized to handle the cooling air flow (cubic feet per minute)
- Location of the outdoor compressor is identified
- Electrical panel is prepared to handle the load for a future air conditioner

**Q:** I am showing compliance for a one-room residential addition. The addition is served by its own heating system. Can I take zonal control credit?

**A:** Only if the entire house is zonally controlled (i.e. all sleeping zones are controlled separately from all living zones) and you are showing compliance using an "existing plus addition" approach.

## Blueprint # 33

**Q:** My building department is holding up the final inspection on a house because the window coverings haven't been installed. Why did this happen? What can I do to avoid this delay in the future?

**A:** This could happen if your energy compliance calculations indicate exterior shading or an interior shading device that is more efficient than the default non-white drapery. If this is the case, then these devices must be installed prior to final inspection. The way to avoid this delay in the future is to demonstrate compliance without calling for special shading devices (non-white draperies do not need to be installed before final inspection) or install the devices specified in compliance calculations.

## Blueprint # 33 continued...

**Q:** I am preparing energy compliance calculations for a loft area (conditioned attic). In some areas of the loft, the ceiling slopes down to within 1 foot of the floor. Is this part of the conditioned floor area?

**A:** Yes, this area is part of the conditioned floor area. For energy compliance calculations the definition of conditioned floor area is not limited to a specific ceiling height; rather, it is determined by the enclosed area of conditioned space.

**Q:** I am trying to determine if the following arrangement of rooms meets the

requirements for zonal control credit. The upstairs of a two-story house has its own HVAC system and contains bedrooms and bathrooms. The downstairs contains a dining room, kitchen, living room and a bedroom, and also has its own HVAC system. Does this meet the zoning requirements?

**A:** No, this separation of rooms would not qualify for zonal control credit. A zone is defined as a group of spaces with “sufficiently similar comfort conditioning requirements.” In order to qualify for zonal control credit, the living and sleeping zones must be separately controlled.

**Q:** I am doing the energy calculations for a two-story home that has some HVAC ducts in the attic and some in the crawlspace. Can I average the duct efficiencies by length of duct for these two conditions? Is any additional documentation required?

**A:** You can weight average duct conditions. The weighting method depends on whether there are multiple HVAC units. If there is one HVAC unit, the weighting is by length of duct. If there are multiple HVAC units, the averaging of ducts is by floor area served by each system. When averaging ducts by length, the documentation required is a mechanical plan indicating the location and length of duct in each condition.

**Q:** Can I take credit for the equivalent of R-7 slab edge insulation for the length of slab between conditioned and unconditioned spaces (i.e. between garage and house)? If so, what is the depth of the insulation that I should assume?

**A:** Yes, you can take this credit. You should take the appropriate slab edge heat loss rate (F2 Factor”) for covered or exposed slab insulated, depending on the slab condition, to a depth of 18 inches.

## **Blueprint # 35**

**Q:** Can trees be counted as shading in my compliance calculations?

**A:** Although trees can be helpful in reducing your cooling load, they are not changeless and may not be permanent. Therefore, as beneficial as they are, trees cannot be counted as exterior shading in compliance calculations.

**Q:** Is the Insulation Certificate (IC-1) submitted with energy compliance calculations?

**A:** No. This form is not submitted with compliance documentation. After the

insulation is installed this certificate must be posted in a conspicuous location in the building.

### **Blueprint # 36**

**Q:** Do the standards allow fluorescent “general” lighting to be activated from the same switch as incandescent “task” lighting?

**A:** No. That would defeat the purpose of having fluorescent lighting. Fluorescents can be made up to five times more effective than incandescent, and the general lighting requirement for fluorescent fixtures give homeowners the ability to use this most efficient light source. Having both light sources on when one is sufficient would negate the benefits of the more efficient light source.

**Q:** When I’m preparing a Form 3R, can I count the R-Value of air space above the insulation in a vented attic?

**A:** Yes. Use the R-values listed.

**Q:** I am designing a house that will have an HVAC system installed in the attic. Ceiling insulation will not be installed under the unit. How do I meet the mandatory minimum ceiling insulation requirement of R-19 when there is no insulation in this area?

**A:** While typically an entire ceiling is insulated to the same level, the standards allow an area-weighted average U-value to achieve compliance with the R-19 minimum ceiling insulation requirement.

**Q:** When I’m using the CALRES program for compliance and I enter the orientation for each of the walls, the program output shows different orientations than I entered. Is there something wrong with my copy of the program?

### **Blueprint # 36 continued...**

**A:** There isn’t anything wrong with your copy of the CALRES program. The “Building Front Orientation” in the building information list is the “actual” direction the front entry faces. The user inputs the orientation of opaque surfaces “relative to the front entry” of the building (see chapter 4 of the CALRES User’s Manual). Therefore, regardless of the orientation of the front of a house, the front wall always has an orientation of 0, left is 90, back is 180, and right is 270. When you run the program it will adjust all of the wall orientations to the “true azimuth” for C-2R.

## Blueprint # 37

**Q:** Do the standards for new buildings preclude me from installing electric resistance \ strip heating with a heat pump, or do I just need special controls?

**A:** You need temperature-based controls which can “prevent electric resistance supplementary heater operation when the heating load can be met by the heat pump alone.” Therefore, electric resistance strip heating is allowed as long as it is equipped with adequate controls to prevent unnecessary operation of this back-up heating source, which is less efficient than the heat pump.

**Q:** If I decide to install a recirculating hot water system to save water, does this have to be included in my energy calculations?

**A:** Yes. Recirculating systems can use a significant amount of energy, especially if they are not equipped with either a time clock or a demand pump. Because of its energy impact, a recirculating system must be included in the energy use calculations, despite its potential to save water.

**Q:** When preparing a compliance submittal for an addition using “existing-plus-addition” compliance, do I need to submit plans for the existing house?

**A:** Yes. While they may be simple, there should be enough detail to allow the building department to verify the calculations. This includes floor area calculations, window and door sizes, ceiling height, as well as wall, roof and floor assemblies.

## Blueprint # 38

**Q:** I use CALRES for my compliance work. I find myself having to input the same window sizes, assemblies and equipment lists for every project. Is there any way to keep these “schedules” for future use?

**A:** Yes. When you first access the CALRES program, create your own schedules of

### Blueprint # 38 continued...

user-defined wall/ceiling/floor assemblies, window sizes, equipment lists (water heaters, furnaces). You can then save this library file using a name you can easily remember (NOTE: Always use the “Files”/”Save” menu option rather than the F2 key to save files). Each time you access CALRES, retrieve this library file, being sure to rename it for the project you’re working on so the existing file will remain intact.

**Q:** What is the correct slab edge condition (installation requirement and modeling assumption) for a hydronic radiant slab?

**A:** The exceptional method for hydronic heating systems with a radiant slab requires that R-10 slab edge insulation be installed. No credit for slab edge insulation can be taken.

**Q:** Does the Commission require original, or “wet”, signatures on the certificate of compliance? Can an energy consultant sign building plans?

**A:** Title 20 (California Code of Regulations), which contains the administrative requirements of the standards, does not state that a wet signature is required. This is left to the discretion of the building department. Other than “Documentation Author” on the Certificate of Compliance (which must be on the plans), an energy consultant should not sign plans unless that person is also the designer, contractor, or building owner (as required by the Business and Professions Code).

### **Blueprint # 43**

**Q:** Does the requirement that recessed lighting fixtures be approved for "zero-clearance insulation cover" apply to recessed fluorescent lights also?

**A:** No, this requirement applies to recessed incandescent lights only (Energy Efficiency Standards, Section 150(k)4.). However, if a fluorescent fixture has no insulation over it, this condition must be accounted for when calculating the U-value of the roof/ceiling assembly.

### **Blueprint # 44**

**Q:** Is it true that if the water heater I want to install has R-16 internal insulation I can't take credit for it?

**A:** You won't receive any credit for having "insulation," but the overall efficiency of the water heater (energy factor) will be higher because of this insulation. This means that if you do not choose to externally wrap the tank with R-12, the effect on

### **Blueprint # 44 continued...**

compliance won't be as great as with a water heater with a lower energy factor. Therefore, you indirectly receive credit.

**Q:** Are the requirements different for piping insulation for a recirculating versus a non-recirculating water heater?

**A:** Yes. Section 150(j)2. of the Energy Efficiency Standards specifies that piping for a non-recirculating water heater must have a minimum of R-4 (R-6 for a pipe diameter greater than 2") insulation on the first 5 feet of hot and cold water pipes from the storage tank. (The cold water pipe requires insulation because it acts as

a heat sink, drawing hot water out of the tank.) For recirculating systems, the recirculating sections of hot water piping must be insulated to a minimum R-4 (R-6 for a pipe diameter greater than 2") for the entire length of the piping, regardless of its location (conditioned space, unconditioned space, buried, in slab or under slab).

**Q:** If my water heater is located within the conditioned space, must I comply with the piping and tank insulation requirements (Energy Efficiency Standards, Section 150(j)2., 151(b)1.)?

**A:** Yes. As water and space temperatures are quite different (120-140° vs. 68-72°), insulation is still beneficial and thus required inside conditioned space.

## **Blueprint # 45**

**Q:** Do decorative gas appliances need glass or metal doors?

**A:** As defined in the Energy Efficiency Standards, Section 101, decorative gas appliances do not need doors. The door requirement applies to masonry or factory-built fireplaces only (Section 150(e)1). Note: If a decorative gas appliance is installed inside a fireplace, the fireplace needs doors. Consult the manufacturer of the decorative gas appliance regarding combustion air requirements as well as health and safety considerations before placing such an appliance in a fireplace with doors.

**Q:** When do the Uniform Mechanical Code (UMC) guidelines for duct installation apply, and when do the Energy Efficiency Standards (Section 150(m)) apply?

**A:** Both apply concurrently. The UMC, adopted by reference in the Energy Efficiency Standards, covers thermal performance, installation and sealing requirements. The Energy Efficiency Standards set a minimum thermal performance requirement for duct insulation (R-4.2 minimum) which usually supersedes the insulation requirements from UMC Section 1005 (higher insulation levels may be

## **Blueprint # 45 continued...**

required by the UMC in areas with 8,000 or more degree days, depending on duct location). [Note: This information is Energy Commission staff's summary of UMC requirements. Commission staff are not authorized to interpret the UMC or any codes other than the Energy Efficiency Standards and its administrative requirements.]

**Q:** What are the compliance requirements for replacing equipment such as air conditioning systems or water heaters that are not part of an addition? What if the replacement unit is bigger?

**A:** Replacing equipment is considered an alteration and the replacement unit must meet applicable mandatory requirements (Energy Efficiency Standards Sections 110-118 and 150). In the case of HVAC systems, the equipment must be certified and any new ducts require R-4.2 insulation. Load calculations may be required by the building department (particularly when the replacement unit is larger). A setback thermostat for specific system types is only required if the thermostat is being replaced. Replacement water heaters (which can be larger) must be certified and, if new pipes are installed, have the appropriate pipe insulation as required by Section 150(j).

**Q:** Is a detached addition to an existing residence (with no breezeway) an addition or a new building?

**A:** This depends on the type of permit issued by the local building department. If the permit is for an addition, you can use compliance approaches approved for additions. If the permit type is for a new residential building, then you must use compliance approaches appropriate for new buildings.

## **Blueprint # 46**

**Q:** The 1992 Energy Efficiency Standards don't specify whether buildings damaged by natural disasters can be reconstructed to their original energy performance specifications. What requirements apply under these circumstances?

**A:** Buildings destroyed or damaged by natural disasters must comply with the energy code requirements in effect when the builder or owner applies for a permit to rebuild. The requirements that apply will depend on whether the scope of work is an addition, alteration or new building.

**Q:** How can I determine if the scope of work is an addition, alteration or new building? And what requirements apply?

## **Blueprint # 46 continued...**

**A:** Section 100 of the Energy Efficiency Standards ("Standards") indicates that the standards apply to buildings "for which an application for a building permit or renewal of an existing permit is filed (or required by law to be filed)." It comes down to whether the change is an "addition" or an "alteration." Changes that require a building permit for an increase in conditioned floor area and conditioned volume are "additions." An addition meets the requirements found in Standards Section 152(a). Changes that require a building permit but do not add conditioned floor area and conditioned volume are "alterations." An alteration is any change to an existing buildings water heating, space conditioning or lighting system or to the envelope

that is not an addition. Alterations must meet any mandatory requirements that apply to the specific component being changed (Standards Section 152(b)). Rebuilding after a natural disaster (if a permit is required) will likely be either an alteration (Standards Section 152(b)) or a new building (Standards Section 152(d)). Requirements for new buildings apply if the local building official determines that the reconstruction is so extensive it is a new building. Repairs and maintenance work that do not require a building permit are not covered by the Standards.

**Q:** If I am simply replacing the windows in a home with new windows of the same size, do I have to meet a specific U-value requirement? When would I have to meet a maximum U-value for an alteration?

**A:** On June 9, 1993, the Energy Commission confirmed an interpretation stating that simply replacing windows with the same size window does not trigger a U-value requirement. Energy Efficiency Standards Section 152(b) provides that windows replaced or added "as part of an alteration" must meet a 0.75 maximum U-value. In an alteration requiring a building permit, any replaced window within the area being altered must have a maximum U-value of 0.75. Also, the 0.75 maximum U-value applies to any window added where one did not previously exist, or when an existing window opening is enlarged. This requirement does not apply to any windows in other areas of the house that are being replaced at the same time.

**Q:** What is a CF-6R and why is it required?

**A:** The CF-6R is an installation certification for manufactured devices regulated by the appliance standards (Part 6 of Title 24, Energy Efficiency Standards). The certification must include a statement indicating that installed devices conform to appliance and building standards and to any additional requirements contained in the plans and specifications. The certificate must be signed by the person with overall responsibility for construction or the person(s) responsible for installing the certified devices and/or appliances. This certificate must be posted to the building permit. Prior to January 1, 1993, some of the information required on the CF-6R (e.g., manufacturer, model number, and efficiency) was shown on the

**Blueprint # 46 continued...**

CF-1R (Certificate of Compliance). This information, however, was not always at the time of permit application, of different models were substituted when actually installed. The CF-6R will help ensure that installed devices conform to specifications and meet or exceed minimum efficiency requirements.

**Q:** What are the plan checking/field inspection requirements related to the CF-6R?

**A:** The CF-6R (Installation Certificate) is not required to be submitted with other compliance documentation at the time of permit application, but rather is posted for field inspection. A field inspector will want to check the equipment installed



against what is listed on the CF-6R and compare the CF-6R and CF-1R for consistent equipment characteristics. California Code of Regulations Section 10-103(a)(3)(B) allows the enforcement agency to request additional information to determine that the building is constructed consistent with approved plans and specifications. When equipment efficiencies above the minimum requirements are shown on the CF-1R (e.g., 12 SEER cooling equipment; 0.63 energy factor water heater), the building department should have procedures in place to verify efficiency. Requiring proof of efficiency from the installer, such as a copy of the appropriate page from the directory of certified equipment, is one possibility. Another possibility is to require that the applicant send a duplicate of the CF-6R through plan check for verification.

**Q:** What happens to the CF-6R after the final inspection?

**A:** California Code of Regulations Section 10-103(b) requires that the builder provide to the "building owner, manager, and the *original occupants* the appropriate Certificate(s) of Compliance and a list of the features, materials, components, and mechanical devices installed in the building, and instructions on how to use them efficiently" (italics added). At a minimum, the information on the CF-6R and CF-1R must be provided to the original-building occupants.

**Q:** Is it possible to receive infiltration and duct efficiency credits (i.e., ducts in conditioned space) for a central furnace, specifically where the furnace closet is either within the conditioned space or is in an indirectly conditioned space and the ducts are located inside the furnace closet?

**A:** It is not possible to get infiltration credit ("no ducts in unconditioned space") or duct efficiency credit unless you have either a pulse or condensing furnace with all of the duct work, including plenums, located within conditioned space, or a ductless heating system. Although pulse and condensing furnace technologies duct the combustion supply and exhaust air from the outdoors, typical furnaces require vented outdoor air for combustion. Once a furnace closet is vented to allow for outside combustion air, the supply and return plenums are no longer in conditioned space.

**Blueprint # 46 continued...**

**Q:** If insulation is installed between floors of an apartment building (sound-proofing), can I install incandescent fixtures that are not IC-rated?

**A:** No. Although this isn't part of the building envelope, the Energy Efficiency Standards Section 150(k) state that any incandescent fixture recessed into an insulated ceiling must be approved for zero-clearance insulation cover.

**Q:** The 1991 Uniform Building Code has a newly defined occupancy category called "congregate residence" that is neither an R-1 nor an R-3. Which standards apply?

**A:** The UBC definition indicates that convents, monasteries and dormitories may be a

"congregate residence." Since these building types are typically R-1 occupancies, congregate residences with three or fewer stories should meet the requirements found in the Residential Manual. A congregate residence with four or more stories must meet the requirements found in the Nonresidential Manual.

## **Blueprint # 47**

**Q:** Is it true walls in new homes can no longer be insulated with R-11?

**A:** The minimum mandatory requirement for walls in new residential construction is R-13 (or a U-value equivalent to an R-13 wall). Whether this is achieved with R-11 insulation combined with rigid insulation, or with R-13 insulation, is up to the owner and/or builder. NOTE: Although R-13 is the minimum insulation level, compliance with the standards may require a higher R-value.

**Q:** Water heating energy use often has a large impact on compliance with the Energy Efficiency Standards. Is there any reason I shouldn't specify the highest energy factor I can find in the Directory of Certified Water Heaters?

**A:** Yes, product availability. Manufacturers sometimes discontinue models and if you have specified a model with a high-energy factor you may have a problem obtaining that model. To avoid problems during plan check, or at installation, it is probably a better idea to specify an efficiency level available from several different manufacturers (NOTE: Check the cross reference in the back of the water heater directory because water heaters with different brand names may be produced by the same manufacturer).

**Q:** Is electric heating allowed in a pool or spa?

**A:** Section 114(a)4 of the Energy Efficiency Standards states that electric resistance heating cannot be used in a pool or spa, with two exceptions. One exception is where 60 percent of the heating energy is from solar or site recovered energy.

## **Blueprint # 47 continued...**

The other exception is for spas that are package units with fully insulated enclosures and tight-fitting covers insulated to at least R-6.

**Q:** Is there a default U-value for the glass in sunrooms?

**A:** For the horizontal portion of the sunroom, use the U-value for skylights. For the vertical portion, use the U-values for either fixed, operable or patio doors, as appropriate. Use either default or NFRC-rated U-values. As a simplifying alternative, the manufacturer may label the entire sunroom with the highest U-value of any of the individual fenestration types within the assembly.

**Q:** How are French doors treated in compliance documentation, for example the U-value and dimensions?

**A:** French doors are fenestration products and are covered by the National Fenestration Rating Council (NFRC) Rating and Certification Program. You may use either an NFRC-rated U-value or a default (patio doors) U-value. The fenestration area for compliance documentation is the entire rough opening of the door (not just the glass area).

**Q:** Are pellet stoves treated the same as wood stoves for the purposes of energy standards compliance?

**A:** Yes.

**Q:** If a wood stove is installed in a wall, does it have to meet the fireplace requirements of Energy Efficiency Standards Section 150(e)?

**A:** No. A wood stove that meets EPA certification requirements, whether it is free standing or installed in a wall, does not have to meet any requirements applicable to fireplaces.

**Q:** If I want to have a gas log or some other device in the fireplace of my home, can I block open the damper? Can it have a standing pilot light?

**A:** Section 150(e)1 of the Energy Efficiency Standards (which contains the requirements for fireplaces, decorative gas appliances, and gas logs), allows the flue damper to be blocked open if it is required by either the manufacturer's instructions or the State Mechanical Code. Continuously burning pilot lights in these appliances are prohibited by Section 150(e)2.

#### **Blueprint # 47 continued...**

**Q:** Section 150(e)2 of the Energy Efficiency Standards states that no fireplace, decorative gas appliance or gas log can be installed if it has a continuously burning pilot light. The Uniform Mechanical Code requires all gas hearth appliances installed in California to have a manually operated shut-off valve, accessible to the inhabited space. Does this shut-off valve meet the intent of this section?

**A:** Not if the pilot light must be manually extinguished when the appliance is off. A unit which meets the intent of this section is one with a pilot light that cannot stay on when the unit is off.

**Q:** The 1988 standards had an exception to the requirement for fireplace doors if the doors would interfere with a heat distribution device. Was this inadvertently omitted?

**A:** No. The exemption was an interim solution to allow manufacturers of heat distribution devices to redesign them so that fireplace doors and these devices did not interfere with each other's operation.

## **Blueprint # 48**

**Q:** Does a CF-1R need to be signed and submitted for alterations?

**A:** Yes. All building permit applications must include a Certificate of Compliance (CF-1R).

**Q:** Why do the standards prohibit the use of medium-base incandescent lamp sockets in some bathroom and kitchen lighting fixtures? Doesn't this rule out all other types of lighting sources including metal halide lamps?

**A:** The Energy Efficiency Standards (Section 150(k)3) do not allow medium-base incandescent lamp sockets for those fixtures providing general or high efficacy lighting. This is to prevent high efficacy lamps from being replaced with less efficient screw-in bulbs. HID lamps can be obtained with various bases which may fit in the socket.

\* Note: If you want to design kitchens and baths with HID lamps, be selective because most HIDs take some time to start up or "fully light."

**Q:** Do new residential buildings or additions consisting of block walls (for example, converting a garage into living space) have to comply with the R-13 minimum wall insulation requirement? If not, what insulation R-value do they need?

**A:** No, the mandatory wall insulation requirement for R-13 applies to frame walls only.

## **Blueprint # 48 continued...**

The amount of insulation needed, if any, will vary depending on the compliance approach selected. Performance compliance (computer) with the standards may not require any additional insulation if the overall compliance is achieved without insulation in that space. Prescriptive compliance may require some level of insulation, depending on the climate zone, package selected, and whether the walls are light (block) or heavy mass. Use Residential Manual Appendix B, Materials Reference, to determine the R-value of the mass wall alone. If additional insulation is required, it must be integral with the wall or installed on the outside of the mass wall (Energy Efficiency Standards, Section 151(f), Tables No. 1-Z1 through 1-Z16, Note 2).

**Q:** What U-value do I use for glass block? Does it need a label?

**A:** The default U-value for an unframed product is 0.57 (if the product is operable, the U-value is 0.60); for a product with metal framing the default U-value is 0.72 (if the product is operable, the U-value is 0.87). A product label is required.

**Q:** What solar heat gain coefficient do I use for glass block?

**A:** Either (1) use a default value from Table No. 1-E, for dual glazing with the appropriate frame type (for no frame use “non-metal”), or (2) obtain the manufacturer’s published SHGC for the product.

**Q:** My home will have a combination of fixed and operable windows. In determining the appropriate U-value for fenestration products, can I assume all windows are “fixed” in my compliance calculations?

**A:** You may assume the more conservative of the default values listed for fixed and operable windows. (Operable windows generally have a more conservative default value but this is not always the case with site built fenestration products.) Alternatively, you may calculate a weighted average U-value based on the actual condition of the windows. NOTE: Typical windows with a fixed portion and an operable portion are operable.

## **Blueprint # 50**

**Q:** If I remove a window from the existing house while doing an addition, can I re-use this window in the addition, or does it need to meet a certain U-value?

**A:** You can use this existing window in the addition; however, you must use a compliance approach that allows you to account for the actual U-value of this window, which may eliminate prescriptive compliance (see default values in

## **Blueprint # 50 continued...**

Table 7-3). Window certification and labeling requirements (Section 116(a)) do not apply to these used windows.

**Q:** If I am doing an alteration, can I move an existing window to another location? Does it need to meet a 0.75 U-value?

**A:** Once you move the window to a location where a window did not previously exist, it must meet the 0.75 U-value requirement because it is added fenestration rather than a window replacement.

## Blueprint # 51

**Q:** Am I exempt from the requirement for a setback thermostat if I have a gravity wall heater or any of the equipment types listed in the exception to Section 150(I)?

**A:** Exemption from the requirement depends on the compliance approach you are using. The latter part of the exception indicates that “the resulting increase in energy use due to the elimination of the setback thermostat shall be factored into the compliance analysis.” The only compliance approach which can model this condition is the computer performance compliance approach. To be exempt from the setback thermostat requirement, the building/space must be modeled with “non-setback.” Any time the alternative component packages are used for compliance, a setback thermostat is required, regardless of the type of heating/cooling system (except wood stoves).

**Q:** Can you explain the criteria for installing loose fill insulation--the Residential Manual contains considerably more information than the Energy Efficiency Standards (Section 150(b)), which only require that the installation conform to manufacturer’s specifications for achieving the labeled R-value?

**A:** The three criteria to consider are: (1) roof slope, (2) ceiling slope, and (3) clearance. All of the criteria are recommendations to ensure even distribution and that insulation installed on a sloped surface doesn’t settle to the extent that it becomes ineffective as a barrier between the conditioned and unconditioned space.

(1) For a fairly typical situation where the ceiling is flat and the roof is sloped, the recommendation is that the roof slope be a at least 2-1/2-foot rise in a 12-foot run, but the slope can be greater. This is to allow enough room between the ceiling and roof for sufficient insulation thickness.

(2) If the ceiling is sloped, loose fill can be used if the slope is no more than a 6-foot rise in a 12-foot run and manufacturer’s restrictions are not exceeded. If, however, the ceiling slope is steep (greater than 6 in 12 feet), you should not use loose fill insulation. (Continued on next page)

### Blueprint # 51 continued...

(3) The recommendation of a 30-inch clearance from the top of the bottom chord of the truss or ceiling joists to the underside of the roof sheathing is to facilitate installation and inspection.

**Q:** In defining the living and sleeping zones for a home with a zonal controlled HVAC system, can laundry rooms and bathrooms (which are not habitable spaces) be included on whichever zone they are most suited to geographically (e.g., a bathroom located near bedrooms)?

**A:** Yes. For computer modeling, include the square footage of any non-habitable or indirectly conditioned spaces with the closest zone.

## Blueprint # 52

**Q:** When preparing compliance calculations for a three-story apartment complex, I have the option of showing compliance for each dwelling unit or for the entire building. If I use the individual dwelling unit approach, do I need to provide calculations for every dwelling unit?

**A:** Each dwelling unit must comply with the standards when using this approach. When dwelling units have identical conditions the calculations may be combined. This means you will show separate compliance for all unique conditions, such as:

- Front facing North
- Front facing West
- Front/side walls facing East and North
- Front/side walls facing East and South
- Exterior roof, no exterior floor
- Exterior floor, no exterior roof

Surfaces separating two conditioned spaces (such as common walls) have no heat transfer and can be disregarded in the compliance calculations. Alternatively, you can model the entire building.

**Q:** I've seen a unique type of wall construction assembly, which consists of both concrete and framing. How do I determine if this wall, or other unique construction assemblies, are "framed walls" which require wall insulation to meet the mandatory requirement (Energy Efficiency Standards, Section 150(c))?

**A:** If the wall is an exterior partition, first determine if it has structural members (studs or hat channels) spaced not more than 32-inches on center (Section 101(b)). Second, determine whether the framing is supporting the load of the building. If both of these criteria are met, the wall is framed and must meet mandatory wall insulation requirements.

## Blueprint # 53

**Q:** Are closable glass or metal doors required for decorative gas appliances?

**A:** No. The only requirement of standards Section 150(e) that applies to decorative gas appliances is the prohibition on continuously burning pilot lights (Section 150(e)2). If there is a question about whether a device is a fireplace, which requires glass doors, the distinction is that a fireplace has a hearth, chamber or other place in which a solid fuel fire or a decorative gas log set may be burned, while a decorative gas appliance is for visual effect only and merely simulates a fire in a fireplace (Section 101.)

**Q:** Although decorative gas appliances with continuously burning pilot lights are

prohibited by the standards (Section 150(e)2), are they legal to sell in California?

**A:** Yes. These appliances can be sold for installation in existing residential buildings, hotels/motels, high-rise residential buildings and nonresidential buildings.

## **Blueprint # 54**

**Q:** I am using computer compliance for a new residence with two rooms in a separate building. Should I model these as separate buildings, each meeting compliance with the standards?

**A:** No. Modeling as separate buildings skews the water heating energy, water heating credits, and internal gains. Model the residence, including the detached building, as one dwelling unit. Be sure to include all exterior surfaces of both buildings.

**Q:** Do the energy requirements of Title 24, Part 6, apply to an addition to a mobile home?

**A:** No. Title 25 requirements, not Title 24, govern mobile homes, including additions to the unit. Jurisdiction in a mobile home park comes under the authority of Housing and Community Development. Jurisdiction of a mobile home on private property may come under the authority of the local building department.

**Q:** There is a new occupancy group R classification in the California Building Code-Division 2 for care homes (residential facilities and residential care facilities for the elderly). Which standards apply to these occupancies?

**A:** Although this new occupancy group is not defined in the Energy Efficiency Standards, the scope of the Standards includes all R occupancies (Section 100). Any R-2 occupancy with three or fewer habitable stories must comply with the low-rise residential standards. High-rise residential standards apply to an R-2 occupancy with four or more habitable stories.

## **Blueprint # 54 continued...**

**Q:** What framing factor should I use for wood joist I-beams with wood webs and wood flanges?

**A:** Use the nominal dimensions and treat these beams like typical lumber (i.e., 2x4, 2x8).

## **Blueprint # 55**

**Q:** If I build a steel-framed wall with R-13 insulation between the framing, does this comply with mandatory wall insulation requirements?

**A:** No. The wall must have the equivalent U-value as a wood framed wall with R-13



insulation, which is 0.088 U-value or better (lower) (Section 150(c)2). To determine if a steel frame assembly meets this U-value, you have several options.

- Use one of the pre-calculated assemblies found in Appendix I of the Residential Manual.
- Calculate the U-value using an ENV-3 for steel frame construction (from Appendix I) or from the Nonresidential Manual.
- Calculate the U-value using EZFRAME or another method based on ASHRAE zone method.

You cannot use any of the following to document the U-value of a steel frame wall:

- Form 3R or any parallel path method, values from Chapter 4, Table 4-4, in the Residential Manual which exceed 0.088 U-value, or any U-value which is more than 10 percent different than values found in or calculated using one of the above referenced sources.

**Q:** If a customer asks me not to install fluorescent lights in their home, are there any other light sources I can use to meet the kitchen lighting requirements?

**A:** Yes, although they may not be readily available, there are products other than fluorescent which meet the lighting requirements of the standards, Section 150(k). The two criteria for the kitchen and bathroom general lighting are (1) a lamp with an efficacy of 40 lumen/watt or more, and (2) the fixtures cannot contain a medium base incandescent lamp socket. Table 2-2 indicates the typical lumens/watt of several common products, some of which meet the required lumens/watt. Specifications from a product's manufacturer can also be used to verify that a product has at least 40 lumens/watt.

## Blueprint # 55 continued...

**Q:** Is a custom window “field-fabricated” for purposes of meeting air infiltration requirements?

**A:** No. Most custom windows are manufactured and delivered to the site either completely assembled or knocked down, which means they are a manufactured product. A window is considered field fabricated when the windows are assembled at the building site from the various elements, which are not sold together as a fenestration product (i.e., glazing, framing and weather-stripping). As stated in the definition, “field fabricated does not include site assembled frame components that were manufactured elsewhere with the intention of being assembled on site (such as knocked down products, sunspace kits and curtainwalls).”

**Q:** I build some multi-family buildings and have some questions about the information I must provide (as required by Administrative Regulations, Section 10-103). Specifically:

- (1) If the building is a condominium, can I photocopy the same information for all units?

**A:** Photocopied information is acceptable. It must be obvious that the documentation applies to that dwelling unit-- that is, the features installed must match the features shown on the Installation Certificate. If compliance documentation is for a "building," a photocopy of the compliance forms for that building must be provided. If individual compliance is shown for each unique dwelling unit, a photocopy of the documentation which applies to that dwelling unit must be provided.

- (2) When the building is an apartment complex (not individually owned units), who gets the documentation?

**A:** The documentation and operating information is provided to whomever is responsible for operating the feature, equipment or device (typically the occupant). Maintenance information is provided to whomever is responsible for maintaining the feature, equipment or device. This is either the owner or a building manager. (Section 10-103(b)(1)-(2).)

- (3) If an apartment is converted to condominiums, does each owner/occupant receive copies of the documentation?

**A:** If, during construction, the building changes from an apartment to condominiums, each owner at occupancy would receive the documentation. If an existing apartment building changes to condominiums at a later date, the documentation requirements are triggered only by a building permit application requiring

**Blueprint # 55 continued...**

compliance with the Energy Efficiency Standards. (Changing occupancy does not trigger compliance with the standards.)

**Q:** What is my responsibility with respect to the CF-6R (Installation Certificate) (a) as an inspector? And (b) as a builder?

**A:** The building inspector is responsible for checking the CF-6R at appropriate inspections to be sure it is filled out and signed for the completed work. Inspectors can verify that the installed features are "consistent with approved plans," as indicated on the Certificate of Compliance (CF-1R) form. Since the CF-6R may be posted at the job site or kept with the building permit, the inspector can request that this form be made available for each appropriate inspection. It is not advisable to wait until the final inspection to check the CF-6R. (Section 10-103(d)(2).)

The general contractor, or his/her agent (such as the installing contractor), takes responsibility for completing and signing the form for the work performed. (A homeowner acting as the general contractor for a project may sign the CF-6R.) The compliance statement for their signature indicates that the equipment or feature: is what was installed; is equivalent or more efficient than required by the approved plans (as indicated on the CF-1R); and meets any certification or performance requirements. (Section 10-103(a)(3)(A).)

**Q:** When plan checking a computer compliance submittal for a high rise residential building, I was surprised that it complied with electric resistance heating. Then I found the heating modeled as an appliance load. Is this the correct way to model space conditioning?

**A:** No. Heating equipment cannot be modeled as an appliance load in the load calculations. If there is additional load caused solely by a process, it is modeled as a process load. For a residence, however, the heating load is for human comfort and is not a process load. It is rare that a building can comply with the energy budget with electric resistance heating as its sole space-conditioning source.

## **Blueprint # 56**

**Q:** I think the Standards are now clear that documentation authors are not regulated by the Business and Professions Code. I am unclear, however, as to the meaning of the sentence in Section 10-103(a)(1) which states “Subject to the proceeding paragraph, persons who prepare energy compliance documentation shall sign a statement that the documentation is accurate and complete” (Title 24, Part 1). What does the phrase “subject to the preceding paragraph” mean?

## **Blueprint # 56 continued...**

**A:** This phrase is to emphasize that the documentation author is performing a service under the authority and responsibility of the person with overall project responsibility. The documentation author is only responsible for the accuracy of the energy compliance documentation. The ultimate responsibility for compliance with the Energy Efficiency Standards remains with the person who is authorized by the Business and Professions Code to take responsibility for the project.

**Q:** When is an historical building exempt from the Energy Efficiency Standards (Title 24, Part 6)? Are additions to historical buildings also exempt?

**A:** A building is exempt from Part 6 when it is a “qualified historical- building.” This term is defined in Section 8-218 of Title 24, Part 8 as a “structure or collection of structures, and their associated sites, deemed of importance to the history, architecture, or culture of an area by an appropriate local, state or federal

governmental jurisdiction. This shall include designated structures on official existing or future national, state or local historical registers or official inventories, such as the National Register of Historic Places, State Historical Landmarks, State Points of Historical Interest, and officially adopted city or county registers or inventories of historical or architecturally significant sites, places or landmarks.”

“Additions which are structurally separated” from the historical building are not exempt from the Energy Efficiency Standards and must comply with current building codes (Historical Building Code, Title 24, Part 8, Section 8-704).

**Q:** As a manufacturer of fenestration products, I place a temporary label with the air infiltration rates on my products (Section 116(a)). Can you clarify which products must be tested and certified?

**A:** Each product line must be tested and certified for air infiltration rates. Features such as weather seal, frame design, operator type, and direction of operation all effect air leakage. Every product must have a temporary label certifying that the air infiltration requirements are met. This temporary label may be combined with the temporary U-value label.

**Q:** I thought I was supposed to insulate the water heater pipes for either the first five feet or the length of piping before coming to a wall, whichever is greater. Did I misunderstand?

**A:** Yes. The requirement is that you must insulate the entire length of the first five feet, regardless of whether there is a wall (Standards, Section 150(j)2). You have two options: (1) interrupt insulation for a fire wall and continue it on the other side of the wall, or (2) run the pipe through an insulated wall, making sure that the wall insulation completely surrounds the pipe.

#### **Blueprint # 56 continued...**

**Q:** When insulating the water heater-piping, do I need to put insulation on the first five feet of cold water pipe?

**A:** Yes. Section 150(j)2 requires insulation on the cold water pipes also. When heated, the water expands and pushes hot water out the cold water line. This can start thermosyphoning, which continues to remove heat from the stored water. The insulation helps reduce this effect.

**Q:** Can I get pipe insulation credit for a recirculating water-heating system?

**A:** No. Recirculating water-heating systems have a mandatory insulation requirement for the recirculating sections of hot water pipes. Pipes less than or equal to 2 inches must be insulated to R-4 and pipes greater than 2 inches need R-6 insulation.

**Q:** If the plans show an electric resistance heater in the bathroom, do I have to include this heater in the energy compliance calculations?

**A:** If the bathroom has a supply duct from the main space conditioning system (typically gas-fired), you can ignore the electric space heating. If the room, however, does not have a supply vent from the main system, the supplemental electric resistance is the heat source for the space. In this latter case you must use a performance compliance approach and model two systems-the main system for the house and the electric system for the bathroom.

NOTE: Consult the Residential Manual or your program User's Manual for guidance in modeling multiple zones that are not zonally controlled.

## **Blueprint # 57**

**Q:** Can I use single-pane windows or skylights?

**A:** New buildings or additions using performance approach (computer) may be able to achieve compliance with single-pane glass. How easy or difficult it is to make up the lost energy efficiency will depend on the climate zone and building design.

New buildings, additions or alterations showing compliance using prescriptive standards are limited to a maximum U-value for fenestration products which prevents the use of single pane glass.

**Q:** Do replacement windows have to meet any specific U-value? When does the 0.75 maximum U-value for fenestration products mentioned in Energy Efficiency Standards, Section 152(b) apply?

## **Blueprint # 57 continued...**

**A:** When replacing windows with the same size window opening there is no maximum U-value requirement. If windows are added (new or different size opening) or replaced "as part of an alteration" (Section 152(b)), then the maximum U-value of 0.75 applies. Thus, if an alteration apart from the fenestration change, requires a building permit, then any replaced fenestration within the area being altered must have a maximum U-value of 0.75; fenestration being replaced in unaltered areas of the house does not need to meet a maximum U-value. For example, if an east wall is being altered at the same time windows on the west are being replaced, only windows affected by the alteration to the east wall must meet the 0.75 maximum U-value requirement.

**Q:** Under what circumstances is a constantly (or continuously) burning pilot light prohibited on certain appliances?

**A:** For compliance with the Energy Efficiency Standards, Section 115 prohibits

continuously burning pilot lights for some natural gas burning equipment (this does not include liquefied petroleum gas burning appliances). The equipment types are:

- \* Household cooking appliances with an electrical supply voltage connection in which each pilot consumes 150 Btu/hr or more
- \* Pool heaters
- \* Spa heaters
- \* Fan type central furnaces

Section 150(e) prohibits continuously burning pilot lights for:

- \* Fireplaces
- \* Decorative gas appliances
- \* Gas logs

For compliance with federal and state appliance regulations (which apply to any appliance sold or offered for sale in California), a constant burning pilot light is prohibited on:

- \* Gas kitchen ranges and ovens with an electric supply cord
- \* Pool heaters, except those that burn liquefied petroleum gas

**Q:** One of my clients wants to use a product that is installed on the hot water pipes and uses electricity to heat the water (in addition to the storage tank). It is not a recirculating system but the end result is the same--no waiting for hot water. The building department told me I need to account for the energy use of this product. How do I include it in the compliance calculations?

#### **Blueprint # 57 continued...**

**A:** There is currently no approved method for accounting for the energy use of a heat cable on water heating pipes. Therefore, it cannot be used in new construction if compliance with the water heating budget is required (Energy Efficiency Standards, Section 151(b)(1)). This product should not be confused with heat tape used for freeze protection. Freeze protection products activate the electric resistance heating tape only when temperatures drop to a point where freezing of pipes could occur. Freeze protection products are not prohibited by the Standards, and need not be included in the water heating compliance calculations. Pipe insulation, whether mandatory or for credit, is still required.

#### **Blueprint # 58**

**Q:** I've seen products that permanently convert a medium-base down-light socket to a

fluorescent fixture. Can these be used to meet the lighting requirements for bathrooms and kitchens?

**A:** Yes, but the conversion must be permanent; i.e., the fixture cannot be changed back to accept medium base incandescent bulbs without destroying the socket. There are products that screw into a medium base product which cannot be removed, thus leaving a different socket which accepts only fluorescent bulbs. Since the bulb can be replaced with a fluorescent bulb only, the fixture effectively does not contain a medium base incandescent lamp socket. These permanent products will provide a new alternative for builders to consider for meeting the high efficacy requirements of the standards (Energy Efficiency Standards, Section 150(k)). Caution: Using these devices can change the dimensions of the fixture and lamp, creating an awkward fit and look (i.e., the lamp may extend outward from the fixture).

**Q:** What are the duct insulation requirements for residential mechanical systems?

**A:** Section 150(m) of the Energy Efficiency Standards requires the greater of R-4.2 or the level required by Uniform Mechanical Code (UMC) Section 604. UMC Section 604 requires R-6.3 duct insulation in two cases:

1. When cooling system ducts are installed on the roof or exterior of the building.
2. When heating system ducts are installed on the roof (exterior) of the building in an area with greater than 8,000 heating degree days.

NOTE: These insulation levels are the mandatory minimum levels. If compliance calculations show a higher R-value is being used for credit, the higher value is required.

### Blueprint # 58 continued...

**Q:** I know that R-4 pipe insulation is mandatory for a recirculating water heating system (on the entire length of recirculating pipe), but is it true that if there is also a demand control system you can get credit for the R-4 pipe insulation? If so, why?

**A:** Yes, this is true. A demand pumping system activates the recirculating pump only when the occupant indicates a need for hot water. Since hot water will not be continuously recirculating through the pipes, the R-4 is not a mandatory requirement and is eligible for pipe insulation credit. A recirculating system with a demand pump and pipe insulation is the only type of system that is eligible for two credits--one for the demand control and one for the pipe insulation.

**Q:** When insulating pipes for a recirculating water heating system, I insulate the entire length of hot water pipes, but do I need to insulate runouts?

**A:** No. Since the water in runouts does not recirculate, they do not need to be insulated.

## Blueprint # 59

**Q:** I'd like to know if it is possible to use non-IC rated incandescent fixtures recessed in an insulated ceiling. Although I've never been able to find a bulb heater (heat lamp) that is IC-rated [approved for insulation cover], they are very popular with my customers. Can I use this product?

**A:** It is possible to build a box of gypsum board or wire mesh over the fixture in the attic, which can then be insulated. By separating the insulation from the fixture, the fixture is not recessed into the insulated ceiling. As long as there is sufficient clearance between the fixture and the insulation to prevent a fire hazard, this assembly is acceptable for meeting Section 150(k)4 of the standards. NOTE: Recessed fluorescent fixtures do not need to be IC-rated.

**Q:** Do I need check boxes on the MF-1R form (Mandatory Measures Checklist)?

**A:** Any version of the mandatory measures checklist form, whether or not it contains boxes or lines, still indicates the responsibility the applicant is taking for complying with the mandatory features listed on the form. If the building department's policy is to take this form into the field and check off the "enforcement" column as each measure is inspected, the applicant should adhere to their request to use a form with spaces for "designer" and "enforcement" to indicate compliance with the mandatory requirement.

**Q:** Can R-16 internal insulation be used as a substitute for R-12 external insulation on a storage water heater?

**A:** No.

## Blueprint # 60

**Q:** Do the Energy Efficiency Standards require an original, or "wet" signature on the Certificate of Compliance?

**A:** Section 10-103 does not specify that a "wet" signature is required. This is left to the discretion of the building department.

**Q:** If I am adding windows to a house (no other work is being done), is there a limit to the amount of glass I can add?

**A:** The only requirements are that windows and skylights (fenestration products) must have a U-value of 0.75 or lower.

**Q:** Are there restrictions on the maximum or minimum size for heating and cooling



equipment in the Energy Efficiency Standards? What are the sizing and selection criteria?

**A:** There are no restrictions on the size of equipment in the Energy Efficiency Standards. Section 150(h) requires load calculations using one of the three listed methods to determine the heat loss and heat gain rates. (The three methods include American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), Sheet Metal Air Conditioning Contractors National Association (SMACNA) Load Calculation Manual, or Air Conditioning Contractors of America (ACCA) Manual J.) The sizing calculations can be prepared by the documentation author, the mechanical contractor doing the installation, or a mechanical engineer. The equipment selection, which is based on several criteria other than the heat gain and loss rates, must be made by an individual authorized by the Business and Professions Code, such as a mechanical engineer or the installing contractor. It is the mechanical contractor who is ultimately responsible for proper sizing and equipment selection.

**Q:** What type of pool covers may be used on heated pools and spas to comply with the Energy Efficiency Standards?

**A:** Section 114(b)2 does not specify any criteria for the pool or spa cover. Any cover will limit heat loss from the surface of the water. It is advisable to use a non-permeable cover.

**Q:** I was checking on the certification of a liquefied petroleum gas (LPG) water heater. I could not find this model, but I found the natural gas equivalent model (same model number). Can I assume the model is certified?

#### **Blueprint # 60 continued...**

**A:** Yes. For boilers, furnaces, gas space heaters, and pool heaters, the Appliance Efficiency Regulations (Sections 1603(e) and (f), state that “models ... intended for use either with natural gas or liquefied petroleum gases may be tested with natural gas and the results applied to both fuel types.” Listing the appliances with their LPG efficiency is voluntary on the part of the manufacturer.

**Q:** I build in climate zone 14 where vapor barriers are a mandatory requirement [also required in zone 16]. Can a moisture barrier be used as a vapor barrier?

**A:** Only if it has a permeance of one perm or less. (A perm is equal to one grain of water vapor transmitted per square foot per hour per inch of mercury pressure difference.) Typically a plastic membrane must be used. Although products such as a continuous polyethylene sheet or wall board with foil backing and any product that meets the vapor barrier permeance rating of one perm or less may be used. Kraft paper backing on batt insulation may qualify if it is installed properly and

the paper backing meets the vapor barrier permeance rating. For proper installation, the Kraft paper tabs on each side of the insulation batt must be fastened to the face of the conditioned side of the framing member. At the edge of the insulated cavity, the Kraft paper must overlap the framing members to create a continuous barrier at the cavity. The Kraft paper cannot be stapled to the sides of the framing members.

## Blueprint # 61

**Q:** I am building a home in which the only space conditioning will be wood heating. Do I have to comply with the Standards? Is wood considered a depletable energy source?

**A:** Wood heating is not considered a depletable energy source, and if a home has no depletable energy sources connected to it, the home would not need to comply with the Standards. However, all of the energy used in the home must be from non-depletable sources to avoid having to comply with the Standards. This includes lighting, water heating, and space cooling. The use of propane, oil, natural gas, or electricity purchased from a public utility for any purpose in the home invokes the Standards. The local building department may also require a back-up heating system.

**Q:** I want to replace my central gas heating system with a central electric heat pump. Section 152 (b) of the standards includes some limitations on electric systems. Am I allowed to install a heat pump? If so, what must I do to show that I comply with the standards?

## Blueprint # 61 continued...

**A:** Yes, you can replace your gas furnace with a central electric heat pump that has a minimum HSPF of 6.6 (single package) or 6.8 (split system). An electric resistance central heating system would also be compared to a central heat pump with an HSPF of 6.6 (single package) or 6.8 (split system). Minor repairs such as replacement of the electric resistance controls, elements, or fan motor need not meet the requirements of Section 152(b).

**Q:** I want to use the Point System and I can not find that chapter in the 1999 manual.

**A:** Since July 1999, the Point System is no longer an approved method of compliance. A new compliance method called Flexible Approach, Simple Trade-offs (FAST) will be introduced as soon as possible. Until FAST is available you must use either the Prescriptive or currently approved computerized Performance approaches to show how compliance is achieved. Certified Computer software programs that may be used for the Performance approach are *CALRES2*, *EnergyPro* and *MICROPAS*. Call the California Energy Commission's Energy

Hotline at 1-800-772-3300 for information on how to obtain the current certified software versions.

**Q:** I am using the Prescriptive approach to show compliance on an addition and I am unfamiliar with the changes concerning interior shading. Can I take credit for interior shading devices?

**A:** No. Effective July 1, 1999, credits for interior shading devices are not allowed in Prescriptive compliance. Credit for roller shades may be taken using the Performance compliance method until December 31, 2001. Beginning January 1, 2002, roller shades cannot be used at all for compliance. However, specific exterior shading devices are allowed, if the Form S is completed. For Form S, look in Appendix A of the Residential Manual – or call the Energy Hotline.

**Q:** What in the world is “Solar Heat Gain Coefficient (SHGC)”? How is it defined and where can I find information about it?

**A:** Solar Heat Gain Coefficient, referred to as SHGC, replaces the Shading Coefficient (SC) used in the 1995 Standards, but the terms are not interchangeable. This new term, SHGC, better defines the performance of windows. A definition is: the SHGC is the ratio of the solar heat gain entering the space through a fenestration product to the incident solar radiation. Shading Coefficient, on the other hand, is the ratio of the solar heat gain through a fenestration product to the solar heat gain through a nonshaded 1/8-inch-thick clear double strength glass under the same set of conditions. Exterior shading devices can influence the SHGC value for the fenestration assembly and the SHGC values can be adjusted to take such devices into account. A Form S (see above Q/A) must be completed to find the total effective SHGC for a specific combination of window and exterior shade. Still

**Blueprint # 61 continued...**

confused? For more information on SHGC; see pages 2-15 through 2-20 and 3-9, 3-10 in the Residential Manual; visit the Commission’s web site and search the “Other Links”; or call the Commission’s Energy Hotline.

**Q:** What are the regulations associated with continuous burning pilot lights?

**A:** These regulations are contained in the Appliance Efficiency Regulations (Section 1605) and the Building Standards (Section 150e2)

Constant burning pilot lights are prohibited in the following:

- (A) Fan type central furnaces.
- (B) Fan type wall furnaces.
- (C) Fan type central furnaces designed solely for installation in mobile homes.
- (D) Household cooking appliances.
- (E) Pool heaters.
- (F) Fireplaces.
- (G) Decorative Gas Appliances.
- (H) Gas Logs.

**EXEMPTION:**

This restriction shall not apply to:

- (A) Appliances designed to burn only liquefied petroleum gases (Not applicable to fireplaces).
- (B) Appliances designed expressly for use in mobile homes and recreational vehicles.
- (C) Cooking appliances which do not have an electrical line voltage supply connection.

**Q:** I have multiple bathrooms and I don't want to use fluorescent fixtures in any of them. Can I do anything instead?

**A:** As an alternative, both of the following are required:

1. A luminaire with 40 lumens/watt lamps must be installed in another room with utilitarian functions such as a laundry room, utility room, or garage for each bathroom that does not have a high efficacy luminaire; and
2. All permanently mounted outside lighting must either be at least 40 lumens/watts or equipped with a motion sensor.

Example: In a two-bathroom home in which the owners do not want to put fluorescents in the bathrooms, they would have to follow the above requirements. They could put a fluorescent fixture in their laundry room, a fluorescent fixture in their garage, as well as motion sensors on their exterior lights.

## **Blueprint #62**

**Q:** I want to design and provide an energy efficient kitchen. I especially want the lighting design to provide an aesthetically pleasing appearance, sufficient light for basic kitchen tasks, and be energy efficient while also complying with the Energy Efficiency Standards. How can I achieve my goal?

**A:** Section 150(k) of the 1999 Energy Efficiency Standards for Residential and Nonresidential Buildings (Standards) states:

“Luminaires for general lighting in kitchens shall have lamps with an efficacy of not less than 40 lumens per watt. General lighting must provide a sufficient light level for basic kitchen tasks and provide a uniform pattern of illumination. A luminaire(s) that is (are) the only lighting in a kitchen will be considered general lighting. General lighting shall be controlled by a switch on a readily accessible lighting control panel at an entrance to the kitchen.

Additional luminaires to be used only for specific decorative effects need not meet this requirement.”

The intent of the kitchen lighting code is not to increase the number of light fixtures and/or watts used by the occupant but rather to insure the builder provides — and the occupant uses — energy efficient lighting.

General lighting — the lighting that the occupant will typically use on a regular basis — is required to be high-efficacy (normally, fluorescent lighting). “Efficacy” is defined in Section 101(b) of the Standards as, “...the ratio of light from a lamp to the electrical power consumed (including ballast losses) expressed in lumens per watt.”

Section 150(k) requires that the general lighting be switched at the kitchen entrance. It also emphasizes that the high-efficacy lighting must provide sufficient light level for basic kitchen tasks and that this lighting must be uniform. The fluorescent fixtures installed may be of varying designs and shapes (i.e., recessed or surface mounted four-foot long tubes, round circline style with flat or convex plastic or glass diffusers, recessed hard-wired “can” downlights, etc.).

Energy Commission staff recommends the builder use one of the following four ways to show compliance:

1. Design and install only high-efficacy luminaires in the kitchen. This scenario meets the code requirement in the most straightforward manner.

### **Blueprint # 62 continued...**

When kitchen lighting includes both high-efficacy sources and low-efficacy sources, the design may not meet these requirements. The second through fourth ways of showing compliance apply to kitchens with both high- and low-efficacy sources.

2. Provide at least 1.2 Watts per square foot (total square feet of the accessible kitchen floor and countertop areas) of light from high-efficacy sources, and insure that, in the judgement of the building department plan checker, the lamps in those fixtures produce a substantially uniform pattern of lighting on kitchen work surfaces (Please note that this is not a code requirement but is a Commission staff recommendation).
3. Make sure that at least 50 percent of the kitchen lighting wattage is high-efficacy, and that, in the judgement of the building department plan checker, the lamps in those fixtures produce a substantially uniform pattern of lighting on kitchen work surfaces (Please note that this is not a code requirement but is an option recommended by Commission staff).
4. If you wish to be certain you have provided an “energy efficient kitchen...an aesthetically pleasing appearance...sufficient light for basic kitchen tasks...while also complying with the Energy Efficiency Standards,” the Energy Commission staff

recommends you use the same procedures used by professional lighting designers (staff does not intend that these procedures become a standard part of builder submittals, but rather that they are used to provide the best possible solutions for builders who wish to provide high quality lighting designs).

These procedures account for the characteristics of the room and the design and location of the specific high-efficacy luminaires that will be installed as the best method to determine if there is both sufficient and uniform light. A recognized lighting authority, the Illuminating Engineers Society (IES), provides guidelines for good lighting design in their *Lighting Handbook, Reference & Application*, 8<sup>th</sup> Edition.

IES guidelines recommend that at least 30 footcandles of light be provided for seeing tasks in kitchens. Seeing tasks include, but are not limited to, the basic kitchen tasks that are described in the Energy Commission's *Residential Manual* as preparing meals and washing dishes. These tasks typically occur on accessible kitchen countertops, the tops of ranges and in sinks, where food preparation, recipe reading, cooking, cleaning and related meal preparation activities take place, as well as at the front of kitchen cabinets so that the contents of the cabinet are discernable.

To clearly demonstrate compliance with the Standards to a building department, the builder may provide a lighting layout design that includes a point-by-point illuminance grid for the high-efficacy lighting. To do this properly, this grid must account for the room geometry, fixture placement, coefficient of utilization (CU) of

## Blueprint # 62 continued...

the fixtures, lamp lumens, lamp lumen depreciation, and reflectivity of all of the surfaces in the kitchen.

Uniform lighting assures that the minimum amount of light is available on all the work surfaces used in meal preparation and cleanup. Although the design should achieve 30 footcandles on most counter-height, horizontal work surfaces, there may be a few work surfaces where the lighting levels fall below this value and the fronts of kitchen cabinets may also be below this value. Even in these locations, the lighting level provided by the high-efficacy source should not fall below the IES-recommended lower value for non-critical seeing tasks of 20 footcandles. Parts of counters that are not work surfaces, such as a corner underneath a cabinet, may have a lighting level below 20 footcandles and still meet the requirements of the standard, because meal preparation is unlikely to occur in those areas.

Manufacturers and lighting fixture representatives can often provide such a grid for a specified design. Electrical engineers who do lighting designs and professional lighting designers also often provide designs with a point-by-point illuminance grid.

The plans should identify the type of luminaire and maximum Underwriters Laboratory (UL)-rated lamp watts for each luminaire, and should include dimensions and tolerances of each luminaire so that the installer, plan checker, and field inspector can all determine when the lighting installation matches the plan checker's judgement. When calculating the kitchen lighting wattage, the builder should be certain to use the maximum UL-rated wattage for each fixture.

Energy Commission staff hopes that this information provides homeowners/builders, designers, builders, and building department personnel a better understanding of how to provide high quality kitchen lighting.

**Q:** When replacing an electric resistance heating unit, the Standards seems to indicate that I have to install one that is more efficient. Can't I use the same type and size?

**A:** Yes, you can replace an electric resistance heating unit with one of the same type and size. However, if the size is increased, load calculations are required. The words, "or the existing fuel type" in Section 152(b)1Bii apply to replacement of an electric resistance heater.

**Q:** How do I model (in the CALRES computer compliance approach) the heat distribution of a non-central space heater? Do I select the choice "R4.2 in the attic?" Do I select "Ducts in conditioned space?" Do I select "Special" or "Crawl Space" or "Basement?"

#### **Blueprint # 62 continued...**

**A:** When specifying a non-central heating system, "None" should be entered as the selection for the "HVAC System Distribution Schedule" in CALRES. The type of system and efficiency should also be changed to reflect the non-central space heater being installed. R4.2 ducts in the attic should be modeled for non-central cooling systems.

**Q:** How do I model (in a compliance approach) a door with a large amount of glass in it?

**A:** You must model either the square feet of the door itself, or the square feet of glass plus an area that includes a two inch frame extension on all sides of the glass. All glazing in doors must have either an NFRC label or use the default U-value and Solar Heat Gain Coefficient from Tables 1-D and 1-E in Section 116 of the Energy Efficiency Standards. The area to be considered a "fenestration product" is either the whole door or the glass area plus a two inch frame extension area on all sides.

**Q:** I am converting a garage into a room addition. The new floor will consist of two-inch sleepers directly on the existing slab, plywood, carpet padding, and carpeting. How would the new floor be modeled in a computer program?

**A:** This type of floor assembly is not found in Table G-13, which lists materials acceptable as exposed mass. Therefore, the floor would be considered a covered slab construction. The construction assembly, as it will be built, should be modeled in the computer program using the U-value for each material. You must prepare a Form 3 showing the assembly and calculate a U-value for the total assembly. Also, be sure to check with your local building department regarding the Uniform Building Code requirements for wood on concrete and for other life-safety issues.

**Q:** Is the volume of a small water heater (rated input less than or equal to 75,000 Btu/hr) required in a residential computer method?

**A:** Yes. In performance methods the volume is one of the required inputs.

**Q:** I want to replace my central gas heating system with a central electric heat pump. Section 152 (b) of the standards includes some limitations on electric systems. Am I allowed to install a heat pump? What must I do to show that I comply with the Energy Efficiency Standards?

#### **Blueprint # 62 continued...**

**A:** Yes, you can replace your gas furnace with a central electric heat pump having a minimum HSPF of 6.6 (single package) or 6.8 (split system). Minor repairs such as replacement of the fan motor need not meet the requirements of Section 152(b). If you are replacing an existing system, you may find it beneficial to install a heat pump with an efficiency considerably higher than these minimums. To perform properly, heat pumps need to move substantially more air than a furnace to provide the same amount of heat. This may require a larger duct system than was originally used for a gas furnace. Contact your local building department, mechanical engineer or contractor for more advice.

**Q:** When an existing central heating unit will also serve a new addition to a home, how would the existing central heating unit be modeled, using the “existing plus addition” computer compliance method?

**A:** You should model the equipment using a 78 percent AFUE central furnace and a 10 SEER air conditioner, with R-4.2 ducts in the attic, in the “existing” and “existing plus addition” computer runs, regardless of actual conditions. However, if the HVAC unit is being replaced during the addition construction, credit is gained by using the values from Table 7-3 (Default Assumptions for Existing Buildings) to



establish the existing efficiencies if they are unknown for the existing home calculation. Then the new unit's efficiency would be used in the "existing plus addition" calculation.

## Blueprint #63

**Q:** I'm a building official. On a permit application I have received, the compliance documentation shows a special report saying the builder used reduced duct leakage to achieve compliance. Why does the builder have this option? Where can I find information on ACM duct credits and what is my role?

**A:** ACM (Alternative Calculation Method) duct credits were established in the 1998 Standards (effective July 1, 1999). Chapter 4 of the *Residential Manual* provides an in-depth discussion of the requirements for using duct and building envelope credits to achieve compliance with the Standards. The Manual (Section 4.3F.) describes the documentation requirements and the responsibilities of the Builder, the Home Energy Rating System (HERS) provider and rater, and the building department. Currently CHEERS (California Home Energy Efficiency System) is the only certified provider. CHEERS can be reached at 209-536-2860 or by E-mail at [rscott@cheers.org](mailto:rscott@cheers.org).

The California Energy Commission determined that HVAC duct systems installed in new residential construction typically have more than 20 percent air leakage. Duct leakage significantly contributes to wasted energy, peak electricity demand

## Blueprint # 63 continued...

and occupant discomfort. The Commission, working with the building industry, enforcement agencies, national laboratories and others, developed protocols for HVAC and building envelope installation that reduce air leakage and assure the efficient use of energy.

New options for Standards' compliance credit are now in effect for HVAC system improvements that will increase actual duct efficiency. Compliance credit for many of the duct efficiency improvements require field diagnostic testing and verification by a HERS rater who is trained and certified by a Commission-approved HERS provider. Diagnostics include using a Duct Blaster™ and Blower Door to test actual duct and building envelope air leakage.

The default duct air leakage is set at 22 percent of fan flow. Compliance credit can be taken for reduced duct leakage if duct leakage is diagnostically measured and verified to be less than 6 percent of fan flow.

This new option allows builders to gain compliance credit by verifying the actual performance of the system. This credit can be used in the computer calculations like any

other credit (higher than default HVAC equipment efficiency, higher than default water heater efficiency, high efficiency fenestration, etc.). It can be traded off between envelope, space heating and cooling, and water heating to achieve compliance.

The credit is substantial. In some climate zones a significant amount of glazing could be added to the building in exchange for using the ACM duct credit and still comply with the energy budget in the Standards.

The building department should plan check the project and verify that the credit has been taken. This can be accomplished by checking the C-2R Form “Special Features and Notes” section located at the end of the form. If applicable, information will appear in the section indicating that duct testing is required. The Building Department’s responsibility is noted in the *Residential Manual*, Chapter 4, Section 4.3F. as follows:

***Building Department***

“The building department at its discretion may require independent testing and field verification in conjunction with the building department’s required inspections, and/or observe the diagnostic testing and field verification performed by builder employees or subcontractors and the certified HERS rater in conjunction with the building department’s required inspections to corroborate the results documented on installer certifications, and in the *Certificate of Field Verification and Diagnostic Testing*. For houses that have used a compliance alternative that requires field verification and diagnostic testing, the building department shall not approve a house for occupancy until the building department has received from the builder a *Certificate of Field Verification and Diagnostic Testing* signed and dated by the HERS rater. The building department at its

**Blueprint # 63 continued...**

discretion may request that the HERS provider report failures, corrective actions, need for full testing and homeowner declines for testing, verification and corrective action.”

When issuing permits, it is recommended that building department staff remind a builder who uses the ACM tight duct credit (or other ACM credits requiring field tests) that test results must be submitted prior to final “signoff” of the building.

**Q:** Can I use low-voltage light fixtures to achieve compliance with the kitchen and bathroom lighting requirements of Section 150k?

**A:** Only luminaire systems that meet the high efficacy requirements of 40 lumens/watt or greater may be installed. All Low-voltage lights available today use less than 40 lumens/watt.

**Q:** When a homeowner replaces a water heater, is it considered to be a “repair” to the water heating system or an “alteration” to the building?

**A:** Replacing a water heater in a residential building is considered a “repair” with some exceptions. Section 101(b), Definitions, states as follows:

**“Terms, phrases, words and their derivatives in Title 24, Part 6, shall be defined as specified in Section 101.”**

The definitions in question are below (from Title 24, Part 6):

ALTERATION is any change to a building's water-heating system, space-conditioning system, lighting system, or envelope that is not an addition. (ADDITION is any change to a building that increases conditioned floor area and conditioned volume.)

**REPAIR is the reconstruction or renewal of any part of an existing building for the purpose of its maintenance (BUILDING is any structure or space for which a permit is sought.).**

(cont...)

#### **Blueprint # 63 continued...**

Several building officials have indicated that they consider, for permitting purposes, a water heater replacement to be a “Repair.” Commission staff agrees. However, calculations must be submitted if the fuel source is changed. In this case, the builder must show that the new water heating system is at least as efficient as the old one. *Energy Efficiency Standards for Residential and Nonresidential Buildings*, Section 152(b) 1. C. (ii).

**Q:** When replacing a residential water heater, what are the energy code requirements?

**A:** In addition to the information given in the question/answer above, replacement water heaters having an “Energy Factor” (EF) of less than .58 must have an R-12 external insulation blanket.

#### **Blueprint #64**

**Q:** I am having trouble with my CALRES program. I finished entering all of my

information, but I have an error saying, “undefined volume”. The only place I can find to enter the volume is under BUILDING INFO at the bottom of the page, but I can’t access that portion of the screen. What can I do?

**A:** You should begin your data entry in a different manner. An error message often means that you didn’t follow the correct procedure for modeling a home using the CALRES program. Whenever you use CALRES, you must start with an existing file. To do this you go into the FILE menu and choose RETRIEVE. Every program has a file named SAMPLE. Start by using this existing program, and then change the information so that it corresponds to your work. Following this procedure ensures that the volume information at the bottom of the BUILDING INFO page will be automatically filled-in based upon the information entered in the ZONES section. Remember that when you have completed your data entry, you must save it under a new file name.

## Blueprint #65

**Q:** *When do the new 2001 AB 970 Residential and Nonresidential Energy Efficiency Standards take effect?*

**A:** The Effective date is **June 1, 2001** for all nonresidential buildings and those residential buildings that do not fall under the exception for the Multiple Orientation Alternative approach.

The following is the actual code language.

**“Effective Date:** The effective date of the AB 970 Building Energy Efficiency Standards amendments shall be June 1, 2001.

Exception:

## Blueprint # 65 continued...

Building energy efficiency standards compliance documentation submitted prior to June 1, 2001, using the Multiple Orientation Alternative of Section 151(c), shall be used to determine compliance through December 31, 2001.”

**The following information is a clarification of the actual code language:**

**Existing subdivisions:** Applications for permits for individual homes that are part of an existing Master Plan can be submitted through the end of December 2001 based on existing compliance documentation using the Multiple Orientation Alternative approach. Applications for permits for individual homes that are part of an existing Master Plan that are submitted after December 31, 2001 must use the 2001 AB970 Standards to determine compliance.

**New subdivisions:**

**Before June 1, 2001:** Applications for new subdivisions with Multiple Orientation Alternative approach compliance documentation submitted into plan check before June 1, 2001 can comply under existing Standards; applications for permits for individual homes using this Multiple Orientation Alternative compliance documentation must be submitted prior to December 31, 2001.

**After June 1, 2001:** Applications for new subdivisions submitted on or after June 1, 2001 must comply under AB 970 Amendments to Standards.

**Recommended procedure for builders:**

The procedure that is recommended (by CBIA and the Commission) to builders for determining which standard to use for new subdivisions that will be submitted for master plan approval between now and June 1 is dependent upon when the majority of the homes will be built. For a small subdivision that will be completed or almost completed by the end of 2001, then it is reasonable to submit under the current (1998) Standards. If the subdivision will have a substantial number of starts constructed after 2001, then it is advisable to submit under the 2001 AB 970 Standards so that energy features do not change mid-construction.

**Q: Can builders still use building cavities or plenums, such as those under an air handler support platform, instead of ducts?**

**A:** No. Although the Mandatory Measures remain pretty much the same as in the 1998 Standards, there have been some changes. One of the most noteworthy changes is to section 150(m), which has been modified as follows: "...Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, ductboard or flexible duct, shall not be used for conveying conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross sectional area of the ducts." Because return air is "conditioned air," "platform returns" complying with the 2001 AB 970 Standards must be fully ducted. Section 150(m) also contains the requirement that "Joints and seams of duct systems and their components shall not be sealed

**Blueprint # 65 continued...**

with cloth backed rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands."

**Q: I heard that the Commission completely changed compliance methods and approaches and made duct sealing and testing, radiant barriers and thermostatic expansion valves mandatory. Is that true?**

**A:** No. The compliance approaches and methods to achieve compliance with the Energy Budget remain essentially the same. General procedures associated with energy design, plan checking and inspection are unchanged. Builders must still comply with the Mandatory Measures and the Energy Budget. To answer the question further, a short description of compliance approaches is needed to clarify what is "mandatory," and what is optional. To comply with the Energy Budget, the builder may choose to use the Prescriptive Approach or the Performance Approach. The Prescriptive Approach requires the builder to construct strictly according to the requirements of Tables 1-Z1 through 1-Z16, the "Alternative Component Packages" (for Climate Zones 1 through 16). The Prescriptive

Approach is similar to a prescription one gets at the drugstore. When a pharmacist fills the prescription he cannot vary the ingredients. Similarly, when a builder chooses to use the prescriptive approach, he cannot trade-off elements of the requirements. For example, if the Prescriptive Package requires R-38 attic insulation, the builder must provide R-38 in all the attics. If the Package limits the amount of glazing (fenestration) to 16% of the floor area, then the builder can use no more than 16%. So, many building designs are unable to achieve compliance using the Prescriptive Packages due to these prescribed requirements. When adopting new Standards, the Commission is required to determine that the requirements are cost effective. The Commission then applies these cost effective energy efficient devices and systems to modify Alternative Component Package D in each of the 16 California climate zones. The revised prescriptive packages result in a buildings that are more energy efficient than ones using the previous version of the Package. Because of the nature of the Prescriptive Packages, most builders use the Performance approach to comply with the Standards. In each case, the design for the proposed building must be compared with the energy budget for that building, determined by modeling the energy use of the Package D features in the proposed building. The proposed design must show that no more energy will be used than the energy budget for the proposed building. The difference between the Prescriptive and Performance approach is that the builder may make trade-offs to achieve compliance when using the Performance approach. The builder may, for instance, use a more efficient water heater, more efficient windows or design the duct system to ACCA Manual D in trade for having more glazing in the proposed house. In the new 2001 AB 970 Standards, Prescriptive Packages A & B are eliminated. Prescriptive Package D has been modified to make new homes more energy efficient. The Commission determined, after much consultation with private sector energy efficiency experts, the California Building Officials (CALBO) and the California Building Industry Association (CBIA), that more

#### **Blueprint # 65 continued...**

energy efficient glazing, duct sealing, radiant barriers, and thermostatic expansion valves (TXVs) would be applied to the Base Case house. Therefore, the builder who uses the Prescriptive Approach will be required to use those features listed above in order to achieve compliance. In Prescriptive Package D, there is an alternative to duct sealing and TXVs. Using Package D for compliance, the builder may choose an alternative of more efficient glazing, and in some climate zones, more efficient air conditioning or heating equipment and more efficient glazing to avoid the special inspection required for duct sealing and TXV's. The Commission has also allowed for an alternative to the TXV but that alternative has yet to be determined (at the time this article went to print). The builder who uses the Performance Approach has the option of using those systems and devices listed above. In order to achieve compliance, he may choose, as in the past, any of the available features to trade-off between the building envelope, space conditioning and water heating. What is the difference under the new Standards? The builder must build a more energy efficient house. The state-wide difference in heating and cooling energy between the 1998 Standards and the 2001 Standards

is about 12 percent. In climate zones where cooling loads are dominant, the difference approaches 23%.

**Q: What are the most significant changes to the Residential Standards?**

**A:** The most significant changes to the residential portion of the Standards are: Duct sealing is required in all climate zones when using Prescriptive Package D. HERS raters must use duct blasters to verify the the HVAC system has leakage less than 6 percent of the fan flow. HERS raters are considered to be Special Inspectors by the Building Department. The HERS rater must demonstrate competence to the satisfaction of the Building Department. Spectrally Selective glazing is required in Package D. Radiant Barriers are required in Package D. Thermostatic Expansion Valves (TXVs) are required for split-system central air-conditioners in specified climate zones when using Prescriptive Package D for compliance. TXVs are installed on the indoor unit next to the coil. They help regulate the refrigerant flow so that the unit performs more efficiently. TXVs must be accessible and require field verification (visual confirmation) by a certified Home Energy Rating System (HERS) rater. The Commission is working on an alternative to TXVs. Compliance credit for interior shading (such as roller shades and mini-blinds) has been eliminated and designers may no longer move shading devices for compliance credit to different orientations when using the Multiple Orientation Alternative. Compliance credit is available for “cool roofs” (roofs that reflect rather than absorb the sun’s rays). Prescriptive packages A and B have been deleted. See Commission Publication 400-01- 002S, the Residential Manual Supplement, for all changes to the Residential Energy Efficiency Standards.

## **Blueprint #66**

**Q: I heard that there are conflict-of-interest requirements that HERS Raters must abide by when doing field verification and diagnostic testing. What are these requirements?**

**A:** By law, HERS raters must be independent from the builder or subcontractor installer of the energy efficiency features being tested and verified. They can have no financial interest in the installation of the improvements. HERS raters can not be employees of the builder or subcontractor whose work they are verifying. Also, HERS raters cannot have financial interest in the builder’s or contractor’s business, nor can they advocate or recommend the use of any product or service that they are verifying. Section 106.3.5 of the California Building Code prohibits a special inspector from being employed (by contract or other means) by the contractor who performed the work that is being inspected. The Commission expects HERS raters to enter into a contract with the builder (not with sub-contractors) to provide independent, third party diagnostic testing

and field verification. The procedures adopted by the Commission call for direct reporting of results the builder, the HERS provider and the building official.

Although they are not recommended by the Commission, “three party contracts” are possible with builders, provided the contract delineates the responsibilities of both the HERS rater to remain independent and the sub-contractor to take corrective action if deficiencies are found. Serving as the contract administrator on such contracts, the sub-contractor may schedule, invoice and pay the HERS rater, provided that the money paid by the builder can be traced by audit. It is critical, however, that these contracts preserve the rater’s ability to independently complete the verification procedures that have been adopted by the Energy Commission.

While “three party contracts” may not actually violate the requirements of the Commission, they offer a greater potential for compromising the independence of the HERS rater, since they set-up a closer working relationship between the rater and the sub-contractor whose work is being inspected.

The Energy Commission has approved the California Home Energy Efficiency Rating System (CHEERS) to certify and oversee HERS raters throughout the state. In that role, CHEERS monitors the propriety and accuracy of the work completed by the HERS raters and responds to any complaints received. If the independence of a rater is questioned, CHEERS scrutinizes the rater’s performance to insure that the results of the field verification and diagnostic tests are objective, accurate and comply with procedures adopted by the Commission.

Building officials have the authority to require HERS to demonstrate their competence, to the satisfaction of that building official. Therefore, in situations where independence of a rater is in question, building officials can prohibit a particular HERS rater from being used in their jurisdiction. They can also disallow any practices they feel will compromise the independence of a HERS rater.

## Blueprint # 66 continued...

**Q: Section 150 (k) states that “general lighting having an efficacy of not less than 40 lumens per watt shall be controlled by a switch on a readily accessible lighting control panel at an entrance to the kitchen”. Does this mean that if a kitchen has more than one entrance that only one of the entrances must have the switching for fluorescent?**

A: Yes. Only one entrance to a kitchen is required to have the lighting control panel for the fluorescent fixtures.

**Q: Does the suction line to the air conditioning equipment have to meet the piping insulation requirements?**

A: Yes. Since the suction line is considered part of the “cooling piping” and is below 55 degrees Fahrenheit, it must be insulated. According to Table 1T, R-3 insulation is required for piping less than 2 inches in diameter.



**Q: If I am using package D for a residential addition of 900 square feet, can I remove a window from the previously existing wall and count that amount of glazing as credit for the room addition?**

A: Yes. You can take credit for the glass removed in an addition as long as you are meeting the requirements of Package D. This credit is allowed for all additions less than one thousand square feet. Once your addition is greater than 1000 square feet, you can not exceed the new fenestration allowed in Alternative Package D.

**Q: I have a home with a wood stove as the primary heat source and electric heating as the secondary source. Since I do not have any ductwork, should I model the system based upon the assumption that I have tight ducts?**

A: Yes. The proposed design for houses with wood heating systems is modeled the same as the standard design, so if the software does not have an option for wood heat, then the compliance author should assume a gas furnace with an AFUE of 78 percent and sealed R-4.2 ducts in the attic.

**Comment:** It is not true that any circumstances where there are no ducts would be modeled as tight. The wording I propose is from the Note 1 of Table 5-4 from the latest working draft of the Residential Manual.

**Q: Do I have to meet the Duct Sealing, TXV, and Radiant Barrier requirements for an 88 square foot addition if I am using the Prescriptive Compliance Approach?**

A: No, additions less than 100 square feet are exempt from the Duct Sealing, TXVs, and Radiant Barrier requirements when using Prescriptive Package D for compliance. If you are adding new split system HVAC equipment, you will then be meeting the definition of an alteration and will have to meet the TXV requirement.

**Comment:** Radiant barriers are not mandatory. They are a part of Package D or Package C compliance. However, the "less than 100 sf" additions path (§152 (a) 1 A) does not reference Package D for anything other than the SHGC requirements. Therefore, radiant barriers are not required for additions "less than 100 sf" using §152 (a) 1 A for compliance.

**Q: Is there an exemption to duct testing, a TXV, and/or Radiant Barriers if you are using Package D for prescriptive compliance for an addition greater than 100 square feet?**

**Blueprint # 66 continued...**

A: No. If the addition is greater than 100 square feet and a duct is extended from the existing duct system, then there is not an exemption to meeting the Duct Sealing requirements which include testing of the duct system. The test requirements for the installation are described in the Residential Manual for Compliance with the 2001 Energy Efficiency Standards. If new space conditioning equipment is installed, then there is also no exemption from the field verification requirements for TXV or proper refrigerant charge and airflow measurements. The alternative described in a footnote to each of the Tables 1-Z1 through 1-Z16 in Section 151 (f) of the Standards, substitutes additional energy efficiency features for the Duct Sealing and refrigerant charge and airflow or TXV features. These substitute features do not require field verification and diagnostic testing, and still provide a way to comply with the Standards. Radiant Barriers are required when using Prescriptive Package D, regardless of whether or not you are using Alternative Components.

**Comment:** This question was much too broad. There were numerous alternatives as it was worded. I have tried to narrow the question to match a "No" answer.

**Comment:** I don't think you should mix questions with very different answers.

**Comment:** I don't think we should refer to the supplements at this late date. Also, there is a different leakage level target than for a completely new building which is described in the new manual.

**Q: Can I replace an electric 40-gallon water heater with two electric 40-gallon water heaters and still comply with the Title 24 Standards?**

A: Yes. It would be considered an alteration. See section 152 of the Standards for specifications.

**Q: Can I place an open-ended fan coil in a plenum when I am building an apartment complex?**

A: Yes, plenums can be used to hold fan coils as long as they meet the requirements of a duct. They must be constructed of either sheet metal or ductboard, and is sealed completely to avoid air leakage. Ducting the entire system is an alternative to installing a system that uses a plenum.

**Comment:** I thought the draft response was misleading and suggest modified language.

**Q: What is a Radiant Barrier?**

A: A radiant barrier is a reflective material that has an emittance of 0.05 or less and is used to reflect and inhibit the emission of radiant heat into or out of a space. In the Standards, it is primarily used to reduce the radiant transfer of heat from a hot roof to the ceiling and to ducts that are in the attic. For more information on radiant barriers, please visit our new online “Training Videos” located on our web site at [www.energy.ca.gov/title24](http://www.energy.ca.gov/title24).

**Q: How do I determine the U-factor and Solar Heat Gain Coefficient for a Bay window?**

A: Bay windows may either have a unit NFRC , an NFRC rating for the window only, or no NFRC rating.

For bay windows that come with an NFRC rating for the entire unit, you should determine compliance based on the rough opening and the given information. If the unit U-factor and SHGC do not meet the Package requirements, the project must show compliance using the Performance approach. When using the

### Blueprint # 66 continued...

performance approach, the area and orientation of the glazing is based on each individual window in the bay window.

Bay windows that do not come with a rating for the entire unit but do come with insulation must comply accounting for the performance characteristics of each component separately. Opaque portions must meet the Mandatory Measures minimum insulation requirements (i.e. R-19 ceiling, R-13 walls, R-13 floor). For prescriptive compliance, the opaque portion must meet the minimum insulation requirements of the packages for the applicable climate zone. For the windows, the U-factor and SHGC values may be determined either from an NFRC rating, or by using default values. If the window’s U-factor and SHGC meet the package requirements, the bay window complies prescriptively. Bay window fenestration area is based on each individual window in the bay window.

## Blueprint #67

**Q: What are the Title 24 requirements related to changing out my split system HVAC equipment at my house?**

**A:** The *Residential Manual*, Chapter 7, page 7-27 explains the requirements. See the text preceding Example 7-17 under the heading, “New Space Conditioning Equipment.” New heating and/or air conditioning systems installed in existing buildings are considered alterations. The appliance standards regulate the efficiency of new residential heating and air conditioning equipment at the point of sale. However, the mandatory requirements for low-rise residential buildings also apply. In particular, Section 150(h) requires that systems be appropriately sized and Section 150(i) requires that the new systems have setback thermostats (see the *Residential Manual*, Section 2.5.3). The prescriptive requirements of Section 151(f) 7 specify that new split system air conditioners or heat pumps installed in alterations must either be:

- verified by a HERS rater to have a thermostatic expansion valve (TXV), or
- **diagnostically tested by a HERS rater to verify the correct refrigerant charge and airflow**

As an alternative to TXV or the requirements for field verification and diagnostic testing for refrigerant charge and airflow measurement, an air conditioner or heat pump with a SEER of 12 or greater may be installed. The Package D requirement for diagnostic testing of ducts does not apply to alterations.

**Q: Do I need to run a calculation before I can get a complete printout from CALRES2, version 1.4?**

**A:** Yes. Go to the CALCS tab and change the “Set Report” section to include the CF-1R and CF-2R forms. The “print” section needs to say either “yes” or “if complies.” If you select “yes,” the CF-2R form will print whether the run complies or not. If you select “if complies,” the CF-1R and CF-2R forms print only if the run complies with the energy budget. Press Alt-G to run the

calculation. Printing should occur automatically when the calculation finishes. If it does not print, check the completeness of the file and/or the printer settings and try again. If you continue to have problems printing, please contact the Energy Commission’s Hotline at 1-800-772-3300.

**Q: What versions of compliance documentation are now acceptable and when did they take effect?**

**A:** *In the months following the adoption of the 2001 Standards, several versions of compliance software were approved for use with the new standards. Several of these versions were decertified, but were allowed for use before January 1, 2002. The following guidance indicates how to treat compliance documentation and specifies currently approved software. (Cont...)*

Blueprint # 67 continued...

- Beginning January 1, 2002, old compliance documentation from 1998 Standards on file at building departments is no longer acceptable. For buildings not yet permitted by this date, the documentation must be resubmitted using currently approved software and fully comply with the 2001 Standards.
- Beginning January 1, 2002, no new compliance documentation may be submitted with MICROPAS6 v6.00 or EnergyPro 3.0. Only compliance documentation from currently approved programs may be submitted after this date.
- Existing compliance documentation using the Multiple Orientation Alternative with MICROPAS6 v6.00 or EnergyPro 3.0 after June 1, 2001 and before January 1, 2002 remain acceptable as long as no changes are made to energy-related features of buildings covered by that compliance documentation.

*Currently approved software includes MICROPAS6 v6.01, EnergyPro 3.1 and CALRES2 v.1.4.*

**Q: The suction line of a new split air conditioner in a low-rise residential building must be insulated. If I know the thermal conductivity, or k-factor, of the pipe insulation, must I determine the required thickness to comply with the R-value requirement specified in Table 1-T, Section 150(j) 2 of the Residential Standards?**

**A:** Yes. To determine the thickness of material needed to meet a specific R-value, multiply the k-factor by the required R-value. For example, if the k-factor is 0.27 (Btu-inch per hour per square foot per °F) and the required R-value is 3, the required pipe insulation thickness is 3 times 0.27, or 0.81 inches. Likewise, if you know the k-factor and thickness of the insulation (in inches), you can determine the R-value by dividing the insulation thickness by the k-factor.

The following information on John's training videos should be a sidebar box with a title within the Blueprint - somewhere: **Title 24 Energy Training Videos Now Online!** and with a graphic such as a video camera (maybe right from the splash page at the URL listed below.)

*The California Energy Commission announces that 28 streaming video segments ranging from 3 to 8 minutes are now online at [www.consumerenergycenter.org/videos](http://www.consumerenergycenter.org/videos). These videos show how to inspect for the energy code, how to install the energy efficient devices or systems, and delineate the benefits of complying with the code. Also included is accompanying text on Frequently Asked Questions (FAQ's), Benefits, Relevant Standard (with links to the Residential Manual and Standards), Resources, and a link to contact the Energy Commission. Please take a look at these videos and tell us what you think! The Energy Commission has just approved a new contract to produce an additional 45 segments on the 2001 Energy Efficiency Standards for Residential and Nonresidential Buildings.*

## Blueprint # 67 continued...

*The following duct sealing Q and A's to be inside on a face to face spread of 2 sheets*

**Q: As a plan checker, can I tell if credit has been taken for “tight ducts” or “sealed ducts” and if the HERS rater verification is required?**

**A:** Yes. Look on the CF-1R under “Special Features, Remarks and Notes” and/or “Field Verification and Diagnostic Testing Required.” If credit has been taken for sealed ducts, it will be shown there.

**Q: Is there an easy way to find a certified HERS rater?**

**A:** Yes. You can find a certified HERS rater on the Internet at [http://www.cheers.org/cheers\\_rater.php](http://www.cheers.org/cheers_rater.php) or by calling 1-800-4 CHEERS (1-800-4 24 - 3377).

**Q: If I am building a house in a city that requires outside air to be mechanically provided, could this impact whether or not I can take credit for sealed ducts?**

**A:** Yes. If the outside air is provided by attaching a duct to the outside to the space conditioning duct system, it probably will be difficult to meet the “sealed duct” maximum leakage requirement. You may not seal off the outside air portion of the system during the “sealed duct” test. It may be possible for the outside air duct to have a damper and pass the test, but the damper would have to allow very little leakage. The “sealed duct” test must be made with the damper in its default position, and the system must pass all the requirements for the sealed ducts test. See the *Residential Manual*, Chapter 4 for specific duct testing requirements.

Another solution to provide the outside air would be to use mechanical ventilation that is completely separate from the space conditioning system. In most cases, separate mechanical ventilation would use a much smaller fan to provide the ventilation and would use considerably less fan energy. Also see our “Ventilation Protocol” at:

[http://www.energy.ca.gov/efficiencyhomes/mechanical\\_ventilation.html](http://www.energy.ca.gov/efficiencyhomes/mechanical_ventilation.html)

**Q: If a single family house has two separate space conditioning systems, do both systems have to be tested by the HERS rater if the “sealed duct” credit is taken?**

**A:** Yes. The HERS rater must test both systems if credit is claimed for duct sealing in the Performance Method or to comply with the Prescriptive Compliance Method.

**Q: When considering duct leakage, are ducts located between floors considered to be located inside conditioned space for conduction purposes?**

**A:** Yes. The portion of the ducts located between floors is considered to have no conduction losses. However, as explained in the following question and answer, duct leakage is considered to be to the outside.

Blueprint # 67 continued...

**Q: In multifamily and single family residences, does the HERS rater have to verify the duct leakage to get full credit for ducts in conditioned space?**

**A:** Yes. If duct leakage is not tested, then ducts are assumed to be at the high leakage point for modeling whether or not the ducts are located in conditioned space. This requirement applies to single and multifamily buildings. The reasoning behind the requirement is that leakage pathways tend to lead to outside the building envelope, even when ducts appear to be physically located inside the conditioned space. Only testing of duct leakage can assure this is minimized. Also see the *Residential Manual*, Section 8, page 8-4.

**Q: When insulation is installed on top of the ducts in the attic, are the ducts in conditioned space?**

**A:** No. It is not acceptable to place attic insulation on top of the attic ducts and then claim credit for ducts in conditioned space. The ducts must be inside the building envelope, which must be well sealed to prevent infiltration. The proper order is: living space, ducts, building envelope, and insulation.

**Q: Do I have to meet the duct sealing and TXV requirements for an addition under 100 square feet if I am using the Prescriptive Compliance Approach?**

**A:** No. If the addition is less than 100 square feet, then you are exempt from the duct sealing and TXV requirements.

**Q: For an addition over 100 square feet, if I am installing a new air conditioner and using the Prescriptive Compliance Approach, do I have to meet the duct sealing and TXV requirements or the Alternative to Package D requirements?**

**A:** Yes. If the addition is over 100 square feet, then you have the choice of meeting the duct sealing requirements or using the Alternative to Package D requirements (see Table 3-2, page 3-3 of the *Residential Manual*). The requirements for testing refrigerant charge and air flow (or installing a TXV) apply only if a new split system air conditioner or heat pump is installed as part of the addition. If a separate air distribution system is installed for the addition, then this new system must be tested and sealed to have a leakage less than or equal to 6 percent of the fan airflow. If an existing air distribution system is extended to serve the addition, this too must be tested, but the tested target duct leakage depends on the size of the addition and other factors discussed in the *Residential Manual*, Section 7.2.3, *Determining the Target Percent Leakage*. In lieu of testing duct leakage, refrigerant charge and airflow (or installing and verifying a TXV), the builder can choose to meet the Alternative to Package D requirements. See Table 3-2 in the *Residential Manual*. Note that Radiant Barriers are required in some climate zones when using the prescriptive packages.

## Blueprint #68

**Q:** In the previous issue of the Blueprint, you explained how to calculate the required pipe insulation thickness to comply with R-value requirements. For pipe insulation thickness to comply with R-value requirements. For pipe diameters less than two inches, commonly available  $\frac{3}{4}$ -inch and one-inch-thick pipe insulation products may not quite meet the R-value requirements for refrigerant and hot water lines. Are there other acceptable ways to determine compliance when pipe insulation does not meet required R-values?

**A:** Yes. For example, if piping with  $\frac{3}{4}$ -inch (refrigerant lines) or one-inch (hot water lines) pipe insulation is run through the attic in a manner which will allow the ceiling insulation to fully cover the insulated refrigerant lines or hot water pipes, then the pipe insulation requirement in Table 1-T, Section 150(j)2 has been met. If the piping is run in an exterior wall that is adjacent to conditioned space, the wall and pipe insulation together may be sufficient. For this installation to be acceptable, care must be taken to enclose the insulated pipe in the wall insulation without compromising the wall insulation effectiveness. The following steps should be taken:

- Piping must be installed so that the wall insulation is between the piping and the outside surface of the wall, minimizing wall insulation compression.
- If blown in wall insulation is used, then the piping must be fully enclosed in wall insulation.
- For hot water pipes with one-inch-thick insulation, if batt insulation is used, it must be split and fitted around the insulated hot water pipes so that the insulated pipes are fully enclosed in wall insulation.
- For refrigerant lines with  $\frac{3}{4}$ -inch-thick insulation, if batt insulation is used, it must either be split and fitted around the insulated refrigerant line, or two batts of insulation must be used, one installed on the outside and one on the inside of the insulated refrigerant line.
- If piping is run in an exterior wall that is not adjacent to conditioned space or in a wall that has conditioned space on both sides of the wall, then the cavity must be filled with insulation on both sides of the pipe. The minimal certified R-value for each side must be R-2.

Note that for pipe diameters over two inches, the pipe insulation must meet the requirements of Table 1-T in the Standards. Also note that pipe insulation thicknesses are actual, not nominal thicknesses.

**Q:** If I am doing an addition but am not replacing my air conditioner, can I use the “Alternative to Package D?”

## Blueprint # 68 continued...

**A:** No. The “Alternative to Package D” can not be used unless all of the requirements specified in the “Alternative to Package D” are met, including the SEER 11, 12 or 13 air conditioner requirement depending on climate zone. If the air conditioner is not being replaced, the only prescriptive option that is available is Package D.

**Q: If I am building an addition less than 500 square feet, do I only have to meet the 0.75 glazing U-factor requirement if I am using the “Alternative to Package D?”**

**A:** No. The “Alternative to Package D” can not be used unless all of the requirements specified in the “Alternative to Package D” are met, including the 0.55 or 0.40 glazing U-factor requirement depending on climate zone. If you want to install windows that only have to meet a 0.75 U-factor, the only prescriptive option that is available is Package D.

Please note that “Prescriptive Requirement for Additions” are explained on pp. 7-6 to 7-8 of the Residential Manual.

**Q: Did the Commission change the energy code requirements that prohibited the use of cloth backed rubber adhesive duct tape unless it is installed with mastic and mechanical fasteners?**

**A:** No. This prohibition has been in effect for the tight duct credit since 1999. In the 2001 Standards, the Commission made the prohibition mandatory for all residential and nonresidential duct systems. Two cloth duct tape manufacturers petitioned the Commission to reconsider the prohibition, resulting in a special rule making proceeding on the issue. The information submitted during this proceeding, including laboratory testing results, expert testimony and written and oral comments, reinforced the appropriateness of the existing prohibition. The Commission’s decision to NOT change the Standards was supported by the California Building Officials, California Building Industry Association, Insulation Contractors Association, Pacific Gas and Electric Company, Lawrence Berkeley National Laboratory, Proctor Engineering Group and Intertape Polymer Group (a cloth duct tape manufacturer). You can review the Notice of Committee Conclusions that explains the reasons for continuing the prohibition at: [www.energy.ca.gov/title24/ducttape/notices/2002-03-26\\_COM\\_CONCLUSIONS.PDF](http://www.energy.ca.gov/title24/ducttape/notices/2002-03-26_COM_CONCLUSIONS.PDF).

**Q: Is laminated glass that is sandwiched by two outer layers of glass with an inner layer material considered a double pane window?**



**A:** No. To be considered a double pane window an air space must exist between the two glass panes, regardless of lamination and coating. The space between the two panes needs to be hermetically dry and sealed airtight. The airspace is commonly 3/16-inches to 3/4 –inches wide.

## **Blueprint #69**

**Q: Do electric resistance floor heating systems need to be certified to the Energy Commission, and if not, are there other requirements?**

**A:** No. There are not California requirements for electric resistance heating to be certified. An efficiency value is still required for compliance purposes, however, and may be acquired from the manufacturer’s specification sheet.

**Q: Do solar day lighting tubes need to meet the same requirements as skylights?**

**A:** No. The National Fenestration Rating Council (NFRC) now has an available methodology to standardize testing of solar day lighting tubing. For more information on the NFRC test method, phone (301) 589-1776.  
For non-NFRC labeled solar day lighting tubes, use the Energy Commission’s Default Table for the default values. If the diffuser is double pane, use the double pane default values, (The diffuser is the piece that is attached to the conditioned side of the ceiling that helps distribute day light into the space. The diffuser must be sealed and caulked to prevent infiltration into the conditioned space [Section 117 of the Standards.] )

## **Blueprint #70**

**Q: May HVAC subcontractors test at rough-in for system leakage when “duct sealing” is required by the energy calculations?**

**A:** Yes. Subcontractors are allowed, for purposes of the CF-6R testing and certification, to test at rough-in. Note that the installer must insure that the spaces between the register boots and the wallboard are sealed after the drywall is installed. Also, the installer is obligated to revisit every applicable house after the drywall is installed to check to see that no leaks have developed since the testing at rough-in. It is prudent for the subcontractor to lower their leakage targets (below 6%) at rough-in so that they will not conflict with the HERS rater’s testing that must be done after the drywall is installed.

**Q: May a certified HERS rater, who does the field verification and completes and signs the CF-4R, do the testing required for the builder or installer to certify compliance with Title 24 installation requirements on the CF-6R?**

**A:** Yes. This approach only works where the certified HERS rater is doing field verification for every house. It is not allowable in the case where the HERS rater is doing field verification only on a sample of homes.

The builder or the installer must sign the CF-6R certifying compliance. The HERS rater may not sign the CF-6R. However, the builder or installer can rely on the HERS rater's diagnostic test results when the builder or installer signs the certification statement on the CF-6R. Of course, if the HERS rater determines that the compliance requirements are not met, the builder or installer may not sign the CF-6R until action is taken to make whatever corrections are necessary. Once corrections have been made, and the HERS rater determines that all compliance requirements are met, the builder or installer may certify the work by completing and signing the applicable section of the CF-6R. The rater then must complete and sign the CF-4R for this building.

\*Note that HERS rater must complete diagnostic testing and field verification (as documented and certified on the CF-4R) after the measure is completely installed. For duct sealing, drywall must be completely installed before testing. A builder may contract with a certified HERS rater to complete testing at rough-in for quality control purposes, but such testing is not sufficient for meeting compliance requirements and certifications on the CF-4R.

## **Blueprint #71**

**Q: Do return ducts have to be insulated if they are located in shafts that are inside the buildings thermal envelope?**

**A:** No, ducts do not need to be insulated if they are inside the buildings thermal envelope. Standards Section 124 (a) and 150(m) talks about requirements for air distribution ducts and plenums.